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THESIS

COMMUNICATION DURING COMPLEX HUMANITARIAN
EMERGENCIES:
USING TECHNOLOGY TO BRIDGE THE GAP

by

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September 2002

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USING TECHNOLOGY TO BRIDGE THE GAP**

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ABSTRACT

Multinational humanitarian and military efforts such as those seen in Somalia, Kosovo and Afghanistan are known as Complex Humanitarian Emergencies. These types of emergencies are complex and difficult to operate in because they contain political, military and humanitarian considerations. The various actors responding to a CHE can be divided into two distinct groups - military and civilian. Each of these groups needs the other to effectively respond to the crisis. Thus communication, collaboration and coordination are critical. Technology can play a significant role to enable information sharing between the various participants during CHEs. This thesis documents the development of a proof of concept that supports this. Current reports and user feedback were analyzed to determine requirements for a field-based system that could enhance the flow of information. The developmental process is presented including, requirements generation, group structure and information sharing, collaborative environments and the advantages of the virtual space. Based on a fictional relief operation, a web application was constructed and designated the Relief Operations Coordination Center (ROCC). Built on COTS technology and combined with commercially available collaboration tools, this application showcases the various uses of today's technology and how it can be used to facilitate information sharing during CHEs.

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LIST OF ACRONYMS

CHE	Complex Humanitarian Emergency
ACTIS	Advanced Concepts, Technologies, and Information Strategies
AIMS	Afghanistan Information Management Service
BBS	Bulletin Board System
CCRP	Command and Control Research Program
CECOM	Communications-Electronics Command
CIMIC	Civil-Military Cooperation
CINCPAC	Commander In Chief Pacific
CMO	Civil Military Operations
CMOC	Civil-Military Operations Center
CMPO	Conceptual Model of Peace Operations
COTS	Commercial off the Shelf
DART	Disaster Assistance Response Team
DR	Disaster Relief
EBR	Evidence Based Research
FCSU	Field Coordination Support Unit
HA	Humanitarian Assistance
HACC	Humanitarian Assistance Coordination Center
HCIC/HIC	Humanitarian (Community) Information Center
HOC	Humanitarian Operations Center
ICRC	International Committee of the Red Cross
IERCM	International Emergency Response Consultative Mechanism
IIC	Integrated Information Center
INSARG	International Search and Rescue Advisory Group
INSS	Institute for National Strategic Studies
IO	International Organization
JTF	Joint Task Force
MDM	Multi-participant Decision-making
MNRR	Ministry of National Reconstruction, Resettlement, and Rehabilitation
MOE	Measures Of Effectiveness
MOOTW	Military Operations Other Than War
MOP	Measures Of Performance
NATO	North Atlantic Treaty Organisation
NDU	National Defense University
NGO	Non-Governmental Organization
OCHA	Office for the Coordination of Humanitarian Affairs
OFDA	Office of U.S. Foreign Disaster Assistance
OSOCC	On-site Operations Coordination Center
POC	Point of Contact

POST	Peace Operations Support Tool
POTS	Plain Old Telephone System
ROCC	Relief Operations Coordination Center
SFOR	Stabilization Force in Bosnia
UN	United Nations
UNDAC	United Nations Disaster Assessment Coordination
UNDAC	United Nations Disaster Assessment and Coordination
UNITAF	Unified Task Force
USAID	United States Agency for International Development
USIP	United States Institute of Peace
USPACOM	United States Pacific Command
VIC	Virtual Information Center
VITA	Volunteers in Technical Assistance
VOCC	Virtual Operations Coordination Center

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EXECUTIVE SUMMARY

The purpose of this research project is to explore the use of technology to enhance collaboration and coordination amongst participants in a Complex Humanitarian Emergency. To this end, a web application was developed to serve as a proof of concept and test bed for current off-the-shelf technologies. The authors detail the process of this project by providing a background of the problems and difficulties associated with collaboration and coordination among the organizations participating in a CHE, the information and technical requirements that must be addressed by a collaboration tool to solve these problems, and the design solution of the proof-of-concept for the focus and scale of this project.

This thesis provides an overview of past and current tools to aid participants of a CHE, group structures and decision-making models, information collection and dissemination, and technical capabilities which have the potential to enhance the coordination and information flow among culturally disparate and geographically separated groups. A risk analysis of implementation and operational issues which must be addressed is also included as part of the research. The technical solution for the proof-of-concept application is the focal point of the research and includes:

- A database used for the collection of the raw data, maintenance, manipulation and dissemination of that data as useful information.
- A web based front end that will be used to access, input and display information from the system.

- Personalized information based on a users profile.
- A proposed network and communications architecture for the system that will address the constraints of the environment that most CHEs are conducted in.

The applicability of this system once built, will be at the tactical/field level of operations during the initial chaotic stages of a CHE. System requirements stress that it be highly mobile, rapidly deployable, and able to interface with a larger more robust system once the CHE reaches a mature stage. Systems are already in place that will enable interface and information exchange, i.e. CIMILINK, VIC, and others; these systems are discussed in detail within this thesis.

I. INTRODUCTION

A. AREA OF RESEARCH

The purpose of this study is to explore the use of technology to enable information sharing and collaboration at the field level during Complex Humanitarian Emergencies (CHEs). This study completes the first phase of a six-phase effort:

1. Phase 1: Establish Proof of Concept

The first phase defines the problems associated with information sharing during CHEs, develops user requirements, examines alternative technological solutions and finally establishes a software-based proof of concept.

2. Phase 2: Development and Testing

Based on a favorable proof of concept, step two develops the information architecture and its requirements. Field experiments are conducted to test the interface and usability of the system platform using decision support systems and collaborative technologies.

3. Phase 3: Solicit Feedback from Users

A cross section of users with experience in CHEs from civilian and military organizations assess the results of the field experiments, provide feedback about the platform and its technologies, and make suggestions for changes to the platform.

4. Phase 4: Finalize Prototype Development

The prototype is modified based on user recommendations. Field tests are then conducted on the prototype and feedback is incorporated into the final design.

5. Phase 5: Train Users

Phase five develops a training program for civilian and military CHE actors to demonstrate how information can be shared at the field level during CHEs.

6. Phase 6: Produce and Deploy System

Phase six completes the research and development and produces a final system ready for deployment.

B. THESIS FOCUS

This thesis establishes the proof of concept. We examine the problems surrounding information sharing during CHEs and explore current technologies to produce a proof of concept that answers our thesis question: Can an Operations Support System be developed to facilitate networking, problem solving and situational awareness among NGO, IO, and military organizations at the field level during Complex Humanitarian Emergencies?

C. STATEMENT OF THE PROBLEM

Within the last decade the world community has responded to a number of complicated, large-scale human tragedies. Following the Persian Gulf War, over 30 nations

and 21,000 troops participated in Operation Provide Comfort. One year later in the Horn of Africa, Operation Restore Hope brought together more than 10,000 coalition forces from 24 nations in an effort to help relieve the suffering from famine in war-torn Somalia. In 1999, hundreds of relief agencies and various militaries under NATO's command responded to the needs of refugees in Kosovo. And today, literally hundreds of groups and organizations are assisting the people of Afghanistan to recover from serious drought and warfare. All of these multi-participant efforts are in response to what have become known as Complex Humanitarian Emergencies.

In the post-Cold War era, the term Complex Humanitarian Emergency or CHE has been coined to describe man-made, or man-exacerbated disasters. CHEs describe today's violent conflicts often involving intra-state struggles that have regional implications. These types of emergencies can result in massive numbers of refugees and internally displaced persons, gross violations of human rights and large-scale disruption of people's livelihoods. Complex Humanitarian Emergencies also can include an international response that extends beyond the mandate or capacity of any one agency or nation and requires a military element for purposes of civilian safety, relief security or logistical expertise. (1) The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) currently documents more than 22 on-going Complex Humanitarian Emergencies around the globe. (2)

Because of their extreme volatility and complexity, CHEs are very difficult to respond to and organize. Unlike

natural disasters such as earthquakes or floods, the human component during CHEs is usually layered with political, military, religious, ideological and ethnic considerations. For example, during the earliest stages, basic relief in the form of food, water and shelter are a priority. Yet the distribution of these necessities can be hampered because of the lack of security and infrastructure (3).

Those who respond to CHEs in an effort to alleviate human suffering must overcome a number of difficult issues. One of the most important is access and the ability to share critical information. With so many organizations and agencies operating simultaneously in theater, each with their own organizational agendas, priorities and structure, it is difficult to keep information accessible and transparent, especially at the field level. Communication among participants often has led to shortfalls, friction and redundancy of effort (4).

D. REASONS FOR FAILING TO SHARE INFORMATION

Failure to share information among CHE participants can be attributed to many factors: an organizational and cultural divide; language differences; competing priorities and perceptions; different profession and cultural norms; and the lack of common horizontal and inter-organizational network support. All of these factors can lead to a lack of trust and stereotyping among the participants.

1. Organizational and Cultural Divide

To understand information sharing during CHEs it is important to understand the people who use the information.

During a Complex Humanitarian Emergency, the actors can be generally separated into two broad categories - civilian and military participants. These two groups are distinct in the way they think, plan and operate. However, they both play a key role and in some ways are mutually dependent during a CHE.

The civilian component is largely composed of humanitarian relief organizations or HROs. During a CHE, HROs from all over the world can take part. In Afghanistan for example, the Afghanistan Information Management Service's (AIMS) Directory of Organizations Working For Afghanistan has over twenty-six pages listing various HROs currently providing some sort of assistance. (5)

The first to respond can be local or host-nation agencies. These agencies provide on-site expertise and natural familiarity with the affected region. Often the region affected will not have the governmental or social infrastructure to provide the necessary relief making the relief effort even more complicated.

Other responding groups take the form of International Organizations (IOs). These are organizations with international mandates and global influence such as the UN and the International Committee of the Red Cross. They provide a global perspective and international awareness when they respond to a regional CHE. (3), (6)

Non-Governmental Organizations or NGOs are another pivotal group of humanitarian agencies that bring needed assistance and expertise to the region. NGOs are non-profit organizations that are not accountable to governments or profit-making enterprises. However, they work with

governments and serve as channels for government assistance during relief efforts. (IBID)

All of the above organizations can enter into a region in an effort to comply with resolutions or fulfill humanitarian mandates. They form a complex patchwork of different efforts working towards a common goal - the alleviation of human suffering.

HROs are generally organized to operate effectively in austere environments. Because of their unique mandates, humanitarian relief organizations tend to be autonomous and decentralized. Their operational focus is at the field level where decisions and assessments are made often under severe conditions. These organizations value the principles of humanity, impartiality and neutrality. (1) They believe that human suffering should be relieved without regard to nationality, political or ideological beliefs, race, religion, sex, or ethnicity. They believe they must remain impartial as best they can in order to be effective.

Neutrality plays a principle role. It requires the provision of humanitarian relief without bias toward or against one or more of the parties involved in the controversy that has given rise to the Complex Humanitarian Emergency. To this end, humanitarian agencies avoid the perception of taking sides in a conflict. This often means purposely distancing themselves from the second major group - the military.

From a military perspective, participation in Complex Humanitarian Emergencies falls under the category of Military Operations Other Than War (MOOTW). The Joint Doctrine for Military Operations Other Than War provides a

general definition for MOOTW as follows: "MOOTW encompass a broad range of military operations and support a variety of purposes: supporting national objectives, deterring war, returning to a state of peace, promoting peace, keeping day-to-day tensions between nations below the threshold of armed conflict, maintaining US influence in foreign lands, and supporting US civil authorities consistent with applicable law. Support of these objectives is achieved by providing military forces and resources to accomplish a wide range of missions other than warfighting." (7)

During CHEs, military forces can fulfill a variety of Military Operations Other than War that include Peacekeeping, Peace-enforcement and Humanitarian Assistance. The general focus of this research will be on those issues associated with Humanitarian Assistance operations. Humanitarian Assistance (HA) is different in nature from Peace Operations. US Military forces execute HA missions when directed by cognizant legal authority. By definition HA includes programs conducted to relieve or reduce the results of natural or man-made disasters or other endemic conditions such as human pain, disease, hunger, or privation that might present a threat to life or result in great damage or loss of property. (3)

As illustrated in Somalia and the Former Republic of Yugoslavia, HA can be conducted simultaneously with Peace Operations. In the case of Kosovo's Albanian refugees, HA was conducted at the same time NATO was executing Combat Operations against the Serbs. It is important to make the distinction that HA operations are designed to support the host nation or agencies that might have the primary focus

of providing humanitarian assistance. The military assumes a supporting role of providing security and stability to enable humanitarian assistance.

Complex Humanitarian Emergencies are more likely to fall under multinational HA operations. During these types of operations the military will be working within the structure of an alliance or coalition and operate within a Multinational Task Force. Supporting US forces will structure themselves as a Joint Task Force (JTF). This task force will be made up of different units to include combat units, service support units and specialized units such as Civil Affairs. (IBID)

When one looks at these two groups of people, considering their organizational mandates and cultures, it becomes easy to see how information sharing can become difficult during CHEs. In general, the humanitarian community is made up of professionals who are motivated and results-oriented. People who are attracted to humanitarian work are often single-minded with a strong moral imperative. (8) The field worker in particular is accustomed to functioning under adverse conditions. They are adept last minute planners, able to execute on the fly and more prone to function through consensus rather than tasking from higher headquarters. (9) Humanitarians operate with a "do no harm" attitude looking at all facets of relief from aid dependence to prevention. The average service person participating in a Humanitarian Assistance Operation can be described as task and mission driven. Military participants understand the importance of

hierarchy within the organization and place a strong emphasis on advance planning and systematic execution.

In comparison, when tasked with HA Operations, military commanders consider the objectives and the principles of unity of effort, perseverance, security, restraint and legitimacy. These provide a general guideline to help the Joint Task Force Commander maximize the effectiveness of force employment in an effort to provide mission focus and prevent mission creep. (7) From a military perspective, a high degree of importance is placed on the protection of forces and operational security.

The following table produced by the Center for Disaster Management and Humanitarian Assistance illustrates the differences between the military and NGO cultures: (10)

The NGO and Military Cultures Contrasted	
NGO	Military
Independent	Highly Disciplined
Decentralized Authority	Hierarchical Command
On the job Training	Extensive Branch Training
Few Field Manuals	Doctrinal Publications
Long-term Perspective	"End State" Approach
Field Experience	Combat Experience

Table 1. NGO and Military Cultures Contrasted

2. Language Barriers

Another obstacle to information sharing during multinational CHEs is language. This may not only mean French as opposed to English, but also the vernacular used by different organizations. What a humanitarian might call a "response" a service person would call an "operation". The humanitarian responds through C3A - Cooperation, Coordination Consensus and Assessment. The Military

conducts an operation using C3I - Command, Control, Communications and Intelligence. Even the use of the word collaborator can mean two very different things depending on your organizational mental model. Humanitarians view collaboration as a good thing, while the military uses the word collaborator with negative connotations. (11)

Barriers are also formed because of the different cultures and operating procedures within the various agencies and military organizations. For example the U.S. military may do things very differently than a Canadian force, and World Vision may have operating procedures that differ from Irish Catholic Relief.

3. Competing Priorities and Perceptions

As complex humanitarian participants enter into the region they each bring different priorities and perceptions. In a CHE aligning mission and goals becomes more challenging with so many different partners. Each participant can have different approaches and operational points of view. The military has a mission mind-set that usually considers security at the top of their priority list, while humanitarians tend to be focused on providing relief. Thus, complex emergencies often become mired in a morass of competing priorities and plans.

Effectively establishing priorities is how missions are accomplished. This is especially true during CHEs. Each organization struggles to fulfill its mandate or mission and the pressures can sometimes be overwhelming. NGOs naturally set their priorities based on donor support. Donor support is usually limited which in turn can create

competition among NGOs. In order to demonstrate effectiveness and ensure the necessary flow of financial support, NGOs jockey for recognition and resources. These competitive pressures often inhibit information sharing among NGOs and other entities that are viewed as a threat to mission viability and success. (9)

The military arrives with its own set of priorities and interests. Those priorities reflect what is important to the Joint Task Force Commander in order to ensure mission success. Typically, the military will be concerned with establishing priorities, measures of effectiveness (MOEs) and developing an exit strategy for each mission. The need to share information is contingent upon the priorities established and the requirements of the overall effort. Ultimately, from a military perspective, information sharing depends on an entity's "need to know." (IBID)

4. Professional and Cultural Norms

When it comes to sharing information, professional and cultural barriers are issues that arise particularly in the civilian-military relationship. As mentioned above the two cultures are made up of people with very different personal motives, professional backgrounds, and organizational structures. The NGO views information sharing with the military as a violation of its nonpartisan/nonaligned status. Humanitarians want to protect their neutrality. In the humanitarian's view it is often the military forces that have had a hand in creating the CHE in the first place. (10) Northern Iraq and Kosovo are examples. NGOs

also view the military as quick to take information yet slow to give it. They see the military collect and then unnecessarily classify data shared by NGOs, thus preventing free distribution to all involved at the field level. (1)

On the other hand, the military is concerned with security and force protection. The challenges they face during a CHE involve developing force structure, defining rules of engagement and interpreting national and international law. They are wary of information shared by NGOs for fear that it is purposely inflated or twisted to support their particular mandate or agenda. The information provided by the NGO might be presented in a way that dramatizes a given situation in an effort to rally donor support. The information can also be difficult to substantiate because it is not generated within the military intelligence system.

5. Lack of Trust and Stereotypes

As a result of the above-mentioned difficulties, a lack of trust can develop among CHE participants. Lack of trust in turn can lead to stereotyping. NGOs sometimes perceive the military as responsible for the destruction of homes, crops and livestock and guilty of serious offenses such as rape, torture, genocide and violations of human rights. And when the conflict does end, they see the military leaving behind unexploded ordnance and landmines that cause long-term human damage.

From the military side, NGOs are often viewed as difficult to work with during CHEs. They want support yet they demand autonomy. NGOs will not respond to orders given

by the military even if their personal safety is at stake. The military see NGOs as resistant to the changes the military brings and unwilling to collaborate in support of military intelligence. NGOs on one hand will openly criticize the military, while at the same time request logistics, communications and transportation support from those same military forces. (9,10)

Based on these views of the other, neither group is able to appreciate that each one provides a vital component for mission success. The humanitarian has local experience and provides professional expertise. He is independent and able to respond quickly. The military provides security, logistics and opens up a protected space for humanitarian assistance to occur. Neither the military nor the civilian can function effectively without the other. They are interdependent during a CHE, making information sharing essential for mission accomplishment.

E. METHODOLOGY

We began this study focused on the issues associated with information sharing during CHEs. We conducted interviews and reviewed the literature on the organizational and technology-based solutions to the problems of information sharing. From this base, we developed an understanding of the requirements and basic functionality needed for a proof of concept.

The prototype we developed is a web-based application that provides civilian and military actors with the functionality required at the field level during a CHE. This application, called the Relief Operations Coordination

Center, serves as a viable proof of concept and satisfies the initial requirements for phase 1.

F. ORGANIZATION

Chapter I provides background information on Complex Humanitarian Emergencies. We examine the various reasons why information sharing during Complex Humanitarian Emergencies is difficult and state the scope and ultimate goals for this thesis. Chapter II provides a literature review of the organizational and technological solutions to information sharing during CHEs. Chapter III generates the requirements for the proof of concept developed from source documents and interviews in Bosnia. Chapter IV reviews the design considerations, both organizational and the technical, in developing the proof of concept. Chapter V illustrates how technology can directly impact relief operations, and presents the final capabilities and characteristics of the proof of concept known as the Relief Operations Coordination Center (ROCC). Finally, chapter VI concludes our thesis by looking at future areas for improvement and development.

II. LITERATURE REVIEW

A. INTRODUCTION

This chapter reviews two general solutions to the problem of information sharing and coordination during CHEs. The first concerns the organizational arrangements that have been developed to improve communications among participating organizations. We briefly review those developed by the military and the UN, indicating some of their successes and limitations. The second general solution focuses on recent attempts to use technology to facilitate information sharing during CHEs. Against this backdrop of 'experiments' and their limitations, we are then better prepared to lay out the requirements for the proof of concept in chapter three.

B. ORGANIZATIONAL SOLUTIONS: MILITARY

Organizational solutions represent a range of coordination mechanisms that have been developed by various participating entities in a CHE. The list below is not meant to be exhaustive, but it identifies the major arrangements that have been devised by military organizations to overcome information-sharing difficulties.

1. The Humanitarian Assistance Coordination Center - HACC

The HACC plays an important role during the early stages of a large humanitarian crisis as seen in a Complex Humanitarian Emergency. A US combatant's command can organize a HACC in order to open communication lines among

other US government agencies, NGOs and IOs. According to Joint Doctrine, the HACC is considered to be a planning and coordinating body that defines the strategy and develops an early assessment of a Humanitarian Operation. (12) However, in Operation Uphold Democracy, the HACC functioned more as a clearinghouse for organizations requesting assistance (13), normally done by the Humanitarian Operations Center or the Civil Military Coordination Center.

2. The Humanitarian Operations Center - HOC

According to joint doctrine, "the HOC is primarily an international and interagency policy making and coordinating body." (12) The HOC is not a command and control agency. The primary goal for the HOC is to coordinate the overall relief strategy, to focus resources and maximize the combined effort of all agencies involved. A large part of what the HOC strives to do is to focus the combined efforts of all involved by identifying and prioritizing humanitarian logistics and support requirements.

The HOC can be established by one of three entities: The host nation government, the UN, or if a US-led unilateral operation, the Office of Foreign Disaster Assistance (OFDA). The Host Nation government can establish a HOC in an effort to maximize the coordination of the humanitarian aid effort. If the host nation government is functioning, then the HOC will most likely operate closely with some sort of Emergency Operations Center. In essence, the HOC provides a host nation with a way to coordinate and

prioritize assistance from international agencies and militaries.

In many CHES the government of the affected region is no longer functioning. In these cases the UN will take responsibility to establish a HOC. NGOs, IOs and military representatives will use the HOC as a multi-agency organizational design tool to ensure coordination and a unified effort. An example of a UN-established HOC can be seen in Somalia during Operation Restore Hope. The southern portion of Somalia was divided into eight separate regions called Humanitarian Relief Sectors. A HOC was established within each sector to facilitate coordination. (13)

Although there is no formal membership for the HOC, it generally consists of representatives from critical agencies and organizations involved in the relief effort. They can include the host nation, NGOs, International Organizations, representatives from the US Embassy or consulate and the UN.

In order to coordinate military support for the various humanitarian agencies, the HOC maintains close connections with another critical agency during CHES known as the Civilian Military Operations Center.

3. The Civil Military Operations Center - CMOC

The Civil Military Operations center or CMOC functions more as an executive agency during CHES. It is the tactical level tool that enables the vital coordination and information flow between the civilian and military agencies. The CMOC is the place where things get done. It is the day-to-day nerve center and critical point of

coordination for civilian and military agencies. The interaction within the CMOC establishes the tone for the operation. To quote Roy Williams, former Director of OFDA, Bureau for Humanitarian Response, USAID, "the CMOC is not a structure, but a relationship." That relationship between the military and civilian component is key to mission success.

The JTF commander can establish a CMOC in an effort to coordinate Humanitarian Assistance needs and match them with military support capabilities. These needs can range from transportation request to providing security for supply convoys. Joint Publication 3-08 makes the following statement on the establishment of CMOCs: "A commander at any echelon may establish a CMOC to facilitate coordination with other agencies, departments, organizations, and the host nation. In fact, more than one CMOC may be established in an AOR or JOA, and each is task-organized based on the mission." (6)

In order to better understand the dynamics of a CMOC, we need to look at who operates within it. From the military perspective, the membership of a CMOC should consist of individuals with the authority to act on the needs of the NGO community. Membership outside the Joint Task Force consists of resident experts and knowledgeable agency representatives. The following is a list of possible CMOC participants:

Military

- Operations personnel
- Civil Affairs
- Communications

- Medical
- HOST Nation or participating forces

Civilian

- Host Country or local government representatives
- Representatives from NGOs and IOs
- Liaisons from service and functional components such as airfields and ports
- USAID/OFDA and DART representation
- Department of State and other US government agencies and

Although there is a suggested organization and membership highlighted within Joint Doctrine, it is important to remember the CMOC is a flexible and mission specific concept. "The CMOC can be anywhere from a tent to a tree, a place to meet all the operators who have power to make decisions" (9) In other words, no two CMOCs will necessarily look or function exactly the same. This is a natural consequence given the dynamic nature of CHES. What was needed during relief operations in Somalia might not be needed in Afghanistan.

The CMOC seems to function more like a political committee than a structured command system. The military is not in charge. There is no power to direct or enforce. The CMOC strives to develop consensus, ensure focus of effort and maximize available assets. Constituted in this way, the CMOC becomes the primary tactical/field level communication, coordination and information sharing system. The information push-and-pull requirements are monumental and often conducted under austere conditions. The following list of CMOC functions taken from Joint Publication 3-57 highlights the wide range of information requirements:

- Providing nonmilitary agencies with a focal point for activities and matters that are civilian related
- Coordinating relief efforts with US and/or multinational commands, United Nations, host nation, and other nonmilitary agencies
- Providing interface with the US Information Service, US Agency for International Development (USAID), and the Country Team
- Assisting in the transfer of operational responsibility to nonmilitary agencies
- Facilitating and coordinating activities of the joint force, other on-scene agencies, and higher echelons in the military chain of command
- Receiving, validating, coordinating, and monitoring requests from humanitarian organizations for routine and emergency military support
- Coordinating the response to requests for military support with Service components
- Coordinating requests to nonmilitary agencies for their support
- Coordinating with Disaster Assistance Response Team deployed by USAID/Office of Foreign Disaster Assistance
- Convening ad hoc mission planning groups to address complex military missions that support nonmilitary requirements, such as convoy escort, and management and security of refugee camps and feeding centers
- Convening follow-on assessment groups

4. NATO Civil-Military Cooperation Centers—CIMIC Centers

US forces use the term Civil Military Operations (CMO) to describe the activities Joint Force Commanders take to ensure positive relations among their forces and other outside agencies within the Area Of Operations. Combined forces such as NATO define this function as Civil-Military Cooperation, known simply as CIMIC.

CIMC functions range from sustaining life to restoring governments. A dedicated staff working at the headquarters level develops CIMIC operations. Their main goal is to ensure effective civil-military cooperation in execution of the allied commander's CIMIC plan. The tasks are then executed by the CIMIC group. The CIMIC group is comprised of specialists in the following fields:

- Public Affairs
- Civil Infrastructure
- Humanitarian Aid
- Economic and Commercial Structures and
- Judicial matters

In recognition of the importance of fostering an open dialog between military and civilian participants, NATO forces will set up a dedicated means of communications. This is accomplished when the CIMIC staff establishes a CIMIC Center.

As seen in Bosnia-Herzegovina, NATO forces established a CIMIC Center to provide a location where NGOs, IOs and military personnel could coordinate and share information. In essence it provided much of the same functionality as a HOC or CMOC.

Any level of command can establish a CIMIC in order to facilitate coordination among agencies. Preferably, CIMICs are located outside the military compound and in closed proximity to other major agencies. This promotes ease of access to all participants and recognizes the concerns humanitarians have of remaining separate from the military. The functions of the CIMIC Center include:

- Provide initial points of contact
- Provide a focal point for liaison
- Facilitate information exchange

- Provide advice on the availability and mechanics of military assistance to civilian organizations and
- Re-enforce the legitimacy of the Force in the eyes of the local population

C. ORGANIZATIONAL SOLUTIONS: UN PERSPECTIVE

When the UN spearheads humanitarian operations, coordinating systems take on different names but essentially provide the same functions as the military. The UN mechanisms for coordinating between humanitarian participants, official entities and agencies are the On-site Operations Coordination Center (OSOCC) and the Humanitarian (Community) Information Center (HIC/HCIC).

1. On-Site Operations Coordination Centre - OSOCC

The On-site Operations Coordination Centre is a mechanism used by the UN Office for the Coordination of Humanitarian Affairs (OCHA) to do many of the same functions the HOC or CMOC accomplishes. The OSOCC provides a rapid assessment and coordination capability during the initial stages of a disaster. As mentioned in chapter one, humanitarian agencies are often operating within an affected region well before the military component of a Complex Humanitarian Emergency. The OSOCC is one of the early coordination tools used by the UN. (14)

The UN establishes the OSOCC for the use of the United Nations Disaster Assessment Coordination (UNDAC) team. The UNDAC team is a stand-by team of voluntary disaster management professionals that can be deployed within hours to carry out rapid assessment and help local authorities in cases of environmental emergencies and natural disasters

such as floods and earthquakes. UNDAC members are considered specialist within their field and are under the direction of the United Nations, Office for the Coordination of Humanitarian Affairs. (IBID)

2. Humanitarian (Community) Information Centre - HCIC/HIC

The Humanitarian Information Center works to guarantee an on-going exchange of information concerning security, humanitarian activities, communications, sector assessments, requests for humanitarian aid assistance, and requests for the use of UN assets. The HIC serves as a physical place where organizations involved in implementing the humanitarian response can come together. The center strives to provide humanitarians with an overall view of the situation. This serves to focus individual efforts where they are needed most. HICs provide the vital function of collecting, analyzing and disseminating information.

The HCIC model was seen in Kosovo. It was established in part by the UN Office for the Coordination of Humanitarian Affairs (OCHA) to assist in the UN-led repatriation effort of Kosovar Albanians. The HCIC functioned as a one-stop coordination and information source for NGOs and IOs. The primary role of the HCIC in Pristina, Kosovo was to promote and facilitate coordination by serving as an information focal point for local and international NGOs, UN and other inter-governmental agencies, donors and KFOR. (15) This was accomplished in part by providing contact lists, local maps and organizing daily briefings for the humanitarian community. The HCIC was also instrumental in standardizing data formats and

developing protocols to ensure the widest dissemination of vital information.

E. TECHNOLOGY SOLUTIONS: OVERVIEW

Each of the organizational arrangements described in the above section offers an example of how to coordinate and share information during CHEs. They have provided some relief, but organizational duplication and the potential for confusion still exists. As LTC Michael M. Smith, CMO/PSYOP Policy Branch Chief, USSOCOM - "it's an alphabet soup" of different terms and systems describing much of the same things." Despite the progress that has been made, coordination problems to a large extent still remain. Thus, many organizations are turning to information technology to deal with their collaboration problems. In large measure, this has been due to the affects of Moore's Law and the rapid development and expansion of the Internet. Today, satellite and Internet technology is being used in such places as Central Asia and the Middle East to help in complex humanitarian efforts. Military and civilian organizations alike have recognized the benefits of developing and using virtual networks and software tools to enable information sharing and facilitate collaboration, communication and coordination.

Figure 2-1 is a graphic representation of key information technology systems that in some way support information sharing during CHEs. The graphic illustrates the timeline and ownership a number of technical initiatives, both military and civilian that have been or are currently underway.

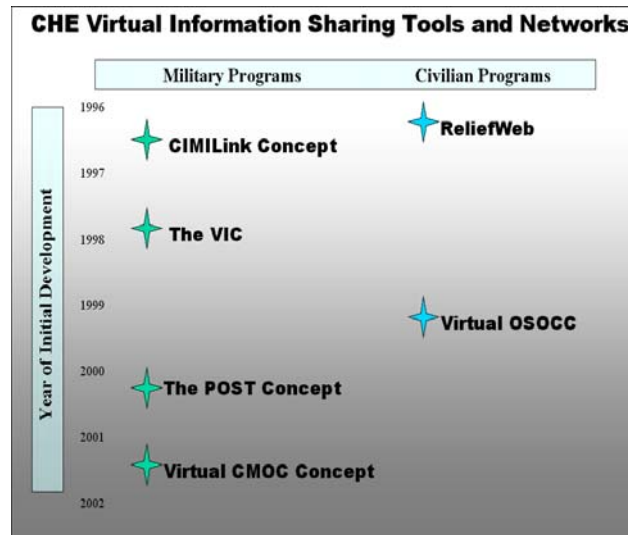


Figure 1. CHE Virtual Information Tools

In the sections that follow we examine the background and functionality of these programs represented in Figure 1. Although not meant to be an exhaustive presentation of humanitarian assistance or disaster related websites, this figure highlights key projects and concepts related to this thesis and serves as the framework for the remainder of this chapter. Our focus is on virtual/web-based applications and networks that provide not just news and information, but tap into one or more of the following:

- Virtual collaboration tools
- Web-based operational analysis
- Current planning data
- Synchronous and Asynchronous applications and
- Critical/timely information sharing

D. TECHNOLOGY INITIATIVES: MILITARY

1. The CIMILink Project

a. Background

As far back as 1996 the Department of Defense recognized the key role technology could play in the effort to improve communication between NGOs and the military in humanitarian and peace operations. After Complex Humanitarian Emergencies such as those in Northern Iraq, Somalia and Haiti, the National Defense University's (NDU) Institute for National Strategic Studies (INSS) Directorate for Advanced Concepts, Technologies, and Information Strategies (ACTIS) attempted to capitalize on lessons learned. As a result of these efforts a subsequent technological research effort developed and became known as the CIMILink Project. (16)

The CIMILink project began as a result of a series of workshops held in April of 1996 by the Directorate for Advanced Concepts, Technologies, and Information Strategies (ACTIS). These workshops were entitled -- Humanitarian and Peace Operations: The NGO/Interagency Interface. They were conducted in order to specifically focus on the civilian - military interface during peace operations.

ACTIS brought together a number of key players from different humanitarian and military communities. They highlighted the problems of communication and coordination during all phases of humanitarian operations and looked into the feasibility of "improving communications between the two communities and within the NGO community itself by developing a networking mechanism to share information, possibly using computer technology." (17)

As a result of this workshop, ACTIS began support for the research, development and fielding of an information system that was "low-cost, user-friendly, responsive to the information needs of the Government and the NGO community, and compatible with the needs of the military." (IBID) The DoD Command and Control Research Program (CCRP) began sponsorship of the Civil Affairs/Coalition Forces Decision Aids prototype/CIMILink Project.

The goal of this project was to develop a set of software tools designed to support the exchange of information and the creation of a common perception of the situation among participants responding to a CHE. The development process used workshops and small focus groups to refine requirements. Based on this data, a set of computer-based tools was developed to facilitate information sharing and support the integrated planning and execution of relief missions. These tools were to be incorporated into a field ready prototype. The U.S. Army Communications-Electronics Command (CECOM) would spearhead the technical aspects of the prototype, while Evidence Based Research Inc, (EBR) a defense contractor focused on the content, overall design, data development, and testing and evaluation.

The CIMILink initial prototype was demonstrated to a number of agencies with favorable response. After presenting the project to Volunteers in Technical Assistance (VITA), EBR learned of a similar research effort underway sponsored by the UN. A partnership was proposed involving VITA, the UN, EBR/NDU, and CECOM to combine

efforts. The resulting design would be fielded in support of a World Bank / World Food Program project with the government of Sierra Leone's Ministry of National Reconstruction, Resettlement, and Rehabilitation (MNRR).

The MNRR established the Integrated Information Center (IIC) where coordination and monitoring of programs was conducted and critical information shared. The CIMILink prototype would be used within the IIC to facilitate information sharing. (18)

b. Functionality

The initial core of the system was known as the "CiMiLink Electronic CMOC". The Electronic CMOC was built around Bulletin Board System (BBS) technology that was customized to reflect the needs of CHE actors. The bulletin board would contain various categories of information, accessible either within a CMOC/HOC/OSOCC/CIMIC Centre, or remotely through cell phone, HF radio, or telnet.

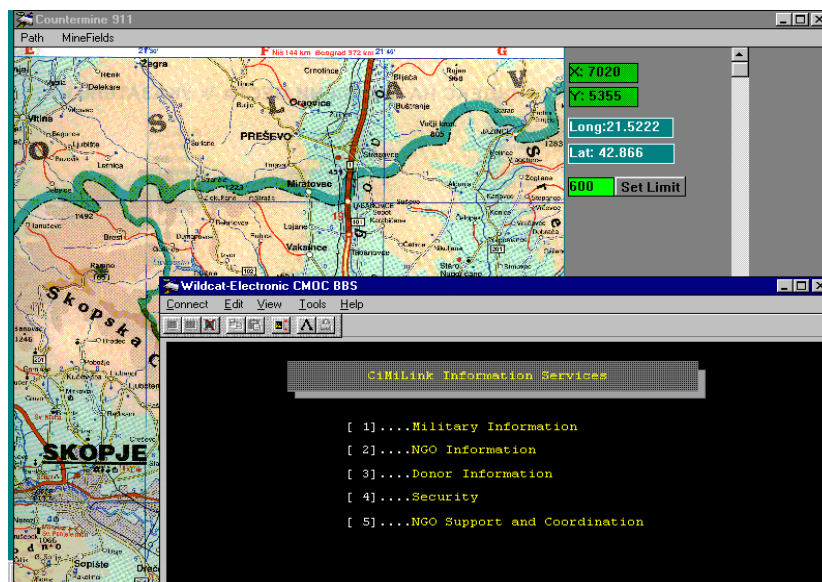


Figure 2. CIMILink Project

Figure 2-2 shows the basic mapping capabilities as well as the DOS based user interface for the Electronic COMOC.

The system was intentionally designed around low-tech solutions to allow greater access by those with limited bandwidth capabilities. The baseline design was developed with the capability to be accessed with a 2400-baud modem on a 286 computer.

CIMILink was subsequently fielded with the following capabilities:

- Email when Internet access was available
- File transfer capability
- Topic areas with critical information
- Remote connectivity for database access and online queries
- Digital mapping systems with country datasets

The CiMiLink program went on to form the backbone of the Sierra Leone Integrated Information Center (IIC). The system was field tested over a six-month period with a United Nations organization having a direct impact on the dissemination of data and providing information services within the IIC. Although VITA subsequently provided EBR with valuable feedback and design recommendations, the CIMILink project did not progress on after 1997. (16)

2. Virtual Information Center - VIC

a. Background

In 1997 the U.S. Pacific Command (USPACOM) participated in a Command and Control Research Program (CCRP) sponsored workshop entitled: Humanitarian Assistance

and Disaster Relief in the Next Century. (19) The focus of the workshop was to use new concepts to apply information superiority to future Humanitarian and Disaster Relief HA/DR operations. The workshop's goal was to somehow match the unprecedented increase in information technology with the mission needs of Humanitarian Assistance/Disaster Relief, (HA/DR) type operations.

The various groups within the workshop recognized the need to establish a collaborative environment and they felt the military could play a key role. This environment would be designed to support HA/DR information needs and promote unity of effort among the diverse participants. New technologies would create the backbone and support this collaborative network. The proposed title for this Network of networks was the Virtual Information Center (VIC).

Taken from the workshop Report the initial idea behind the VIC was documented as follows:

The VIC would support both military and NGO/PVO/IO communities' participation in an HA/DR operation. It would be netted in the field with reach-back to home organizations for information support and material tracking. The military would be a participant in this net, but through a plug-in interface that protects it from intrusion but provides standardized data translation that can be shared with controllable subsets of the participants. The network itself would be commercially provided and the VIC interface function would probably be provided as a UN service package by a selected NGO. (20)

The VIC concept went further to provide mapping, weather, imagery, and other sensor and GIS services from

commercial sources. The general goal was for the VIC to "stimulate the pooling of data, coordinate source selection for information and fusion, provide data translation, and promulgate data standards." (20)

b. Functionality

Today, The VIC Program, although not true to original form, currently supports the Commander In Chief Pacific (CINCPAC) by providing situational awareness in the form of a fused Picture, developed through open source means. (21)



Figure 3. Examples of The VIC functionality

The VIC provides access to a large amount of information regarding a wide range of security and humanitarian issues throughout the Pacific Theater. In essence, the VIC provides the CINC and others with an unclassified, synthesized view of a given situation. The

VIC staff accomplishes this by scouring open source information and relying on unclassified contributions from supporting agencies. Figure 2-3 shows examples of The VIC's user interface when providing functionality such as Virtual Library access and Requests For Information.

A key component of the VIC is its close collaboration with other agencies. The VIC's "Information Partners" include other Pacific Command resources such as the Center of Excellence In Disaster Management and Humanitarian Assistance and the Pacific Disaster Center. The VIC's functionality involves the ability to search, collaborate, analyze, validate, integrate and disseminate information generated in-house and through its collaborative relationships. (IBID)

3. The Peace Operations Support Tool - POST

a. Background

In December of 2000 a proposal from J081, U.S. Pacific Command was submitted to prototype a tool that would assist in collaboration and information sharing during CHEs and Peace Operations. This tool would be user friendly, intuitive and multi-platform capable. The goal of this tool would be to "tie together a framework model of complex humanitarian emergencies and peace operations, related databases and other information sources." (19) This information would be categorized and accessible through a web-based system. The entire system would function as a collection of tools designed to support Complex Humanitarian contingencies.

The system would be built around George Mason Universities Conceptual Model of Peace Operations (CMPO) developed by Professor D.F. Davis. The CMPO organizes the results of extensive development in a collaborative environment with representatives involved in CHEs and peace operations. It is a structured hierarchy that models the functions involved within the areas of peace operations under three branches: Peace Making, Peace Building, and Peace Support. Within these branches functions are broken into sub functions down to six layers maximum. (22) The model provides a solid organization of mission and information needs and structural foundation for POST.

The POST project has gained recognition for its value added potential during the planning and execution phases of CHEs. Partnering with USCINCPAC in this project are the Center of Excellence in Disaster Management and Humanitarian Assistance, George Mason University's School of Policy Program on Peacekeeping Policy, Australia's Defense Science and Technology Organisation and the Institute for Defense Analysis.

b. Functionality

The POST provides CHE participants with access to a wide range of information sources as well as a number of technological tools. These have been presented in six broad categories within POST. (23)

Responding Organizations. Provides information on responding organizations in different categories, with COE tracking actual organizations as they respond to a crisis.

Lessons Learned: COE maintains a repository of various lessons learned by a number of organizations made available to users through the system.

Subject Matter Experts: A complete listing of experts within the fields associated with the universe of CHE and Peace Operations. The system will provide access of point of contact information.

Analytical Tools: POST will provide over 100 analytical tools developed by CINCPAC, U. S. Army's CAA, TRAC-Lee and Australia's DSTO that pertain to CHE and Peace Operations.

Training, Readiness and Operational Capability Requirements. A compilation of requirements garnered through work with International Association of Peacekeeping Training Centers

Measures of Effectiveness and Measures of Performance. The POST will provide access to approved MOEs and MOPs developed by International Organizations and compiled by COE.

Figure 3-4 shows the index page and the subject expert functionality of the POST Prototype.

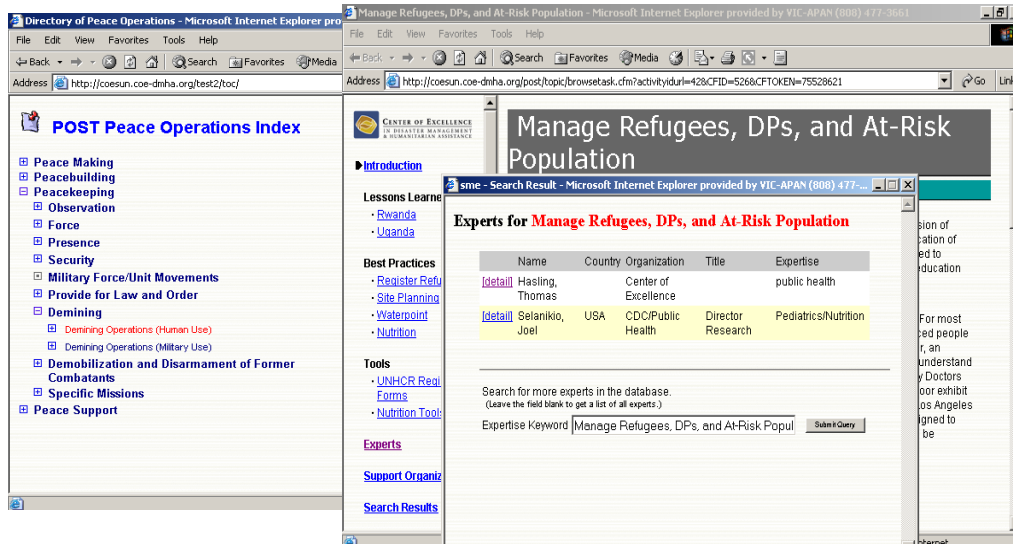


Figure 4. Peace Operations Support Tool

4. Virtual CMOC

a. Background

The Virtual CMOC concept is another cutting edge technology project pursued by USCINCPAC and its resources. This program is still at a very early conceptual stage. It is presented here because it directly applies to our area of research and has the potential to embody the concepts and findings presented within this thesis.

The Virtual CMOC concept stems from the need to maximize the availability of information to as many CHE participants as possible. As mentioned within Chapter one, the CMOC is the U.S. Military's principal field level coordinating mechanism during CHES. The Virtual CMOC will focus on taking existing information structures and looking for efficient and rapid ways to digitally process and share the information. This would enable critical information to

be accessible not just at the field level, but at the operational and strategic levels as well. This will also help integrate and more widely disseminate key pieces of data. The framework of the Virtual CMOC will rely heavily upon the following:

- United Nations documents
- Local procedures
- CMOC policies, procedures, meeting schedules, agendas
- Reporting formats
- Other operation-specific references

The above information sources and processes will help structure the core functionality of the CMOC.

b. Functionality

Although much of the functionality for the Virtual CMOC is still under development, there is a basic consensus of what should be included. Some of the already agreed upon capabilities involve:

Humanitarian tracking. The ability to provide a database of who's doing what where. This would enable operational planners, both military and civilian to focus effort and maximize resources.

Assistance request and tracking. One of the main functions of the CMOC is to provide a place where civilian agencies can request assistance from military forces. The ability to process and track these request for assistance would be a vital function of the Virtual CMOC.

Personnel locator. During an operation in response to a CHE, finding key personnel can be difficult in a chaotic environment. The Virtual CMOC would

incorporate the ability to locate and perhaps contact key decision makers during a humanitarian response. (IBID)

Figure 3-5 shows the proposed interface for functions such as assistance request tracking and humanitarian personnel locator.

The image shows two web browser windows. The left window is titled 'REQUEST FOR AIR CARGO TRANSPORT' and contains a form with the following sections:

- Tracking Details:** Date of Request (D/M/Y), Organisation, Action Officer, Point of Contact.
- Flight Details:** Name, Country, Departure Airfield, Destination Airfield, Ready to Move Date (DDMMYY), Latest Arrival Date, Routing Remarks.
- Cargo Details:** Description, Weight (MT), Size (Cubic Metres), Length x Width x Height (m), Dangerous Air Cargo (Y/N), UAC details.

The right window is titled 'Diamond Region Humanitarian Organizations and Responsibilities' and displays a table of organizations managed by the UN. The table has columns for 'Management' and 'Contracted/Supporting'.

Category	Management	Contracted/Supporting
Overall Region Management	SRSG	
Refugee Protection	UNHCR	
Coordination & Communications	OCHA	
Food	WFP, UNHCR	World Vision, Oxfam
Logistics	WFP	CARE, Oxfam
Shelter	UNHCR	CARE, Oxfam
Health	WHO	UNICEF
Water & Sanitation	UNHCR	World Vision

Figure 5. Virtual CMOC Interface

c. Summary: POST and Virtual CMOCs

The virtual CMOC provides access to much of the same type of information as the physical CMOC. However, the value added is the enhancement of availability, integrity and data standardization.

Current developmental plans for both the Virtual CMOC and the POST involve field-testing during a real-world training scenario. USPACOM intends to do this during the 2002 Cobra Gold training exercise. These systems are to be manned with research personnel and shadow both the command element and CMOC during the exercise. The information

requirements is to be gathered and processed using the two tools. Thus, a parallel information path is to be used to examine the effectiveness of the two systems. A set of Measures of Effectiveness and Measures of Performance are then to be analyzed to determine the viability of both systems for future development.

E. TECHNOLOGY SOLUTIONS: CIVILIAN

1. ReliefWeb

a. Background

The humanitarian community recognized early on that the World Wide Web provided a unique opportunity to gather and distribute critical information. During the early stages of the Web there were a number of humanitarian organizations providing data to different sites. Each of these sites contained bits and pieces of critical information relating to humanitarian operations. In order to gain information on a particular operation, one would have to search a number of sites. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) recognized the need for a one-stop consolidation point for all things relating to Humanitarian Assistance and Disaster Relief. In 1996 they responded by establishing ReliefWeb under the following mandate:

To strengthen the response capacity of the humanitarian relief community through the timely dissemination of reliable information on response, preparedness and disaster prevention.
(24)

The founding concepts for ReliefWeb were born from a bottom up consensus among NGOS and IOs that there was a need to consolidate information. "Information was seen as a public good, and that well informed decisions should serve as the basis for relief actions." (Ibid) ReliefWeb operates on the foundation that its partners provide the core of its knowledge base. As a result, ReliefWeb was recognized early on as a good idea and quickly received buy in from a number of humanitarian, military and government organizations.

According to ReliefWeb, it receives information from over 700 sources, including NGOs, government agencies and the media. (Ibid) They strive to be relevant, dynamic and responsive to their target audience, which is comprised of a wide range of practitioners and advisors. Today ReliefWeb has approximately 3.5 million hits weekly and is recognized as the primary on-line source of humanitarian information.

b. Functionality

ReliefWeb operates with a 1.5 million dollar budget and maintains offices in New York, Geneva and Kobe, Japan. They use technology to provide a wide range of information and services to the humanitarian community. Table 2 highlights the resources ReliefWeb has available.

Latest Updates:	Documents posted on emergencies and natural disasters within the past 72 hours
Complex Emergencies:	Humanitarian response information on

	current emergencies and countries of concern
Natural Disasters:	Disaster response information on current natural disasters and archival material dating back to 1981, listed chronologically
By Country:	Response documents by country with a complete set of external background links by sector
Background:	An extensive set of external background links by country and sector
Financial Tracking:	Funding requirements and donor contributions for complex emergencies and natural disasters
Map Center:	Reference and thematic maps concerning current and past humanitarian emergencies and natural disasters, by geographic region and country
Humanitarian Vacancies:	Jobs and volunteer openings in the global humanitarian community
Directory of Humanitarian Organizations:	Contact information for UN relief agencies and NGOs
Library:	An on-line archive of humanitarian, human rights and development reference documents
Emergency Telecommunications:	Information and resources available for the provision of emergency telecommunications during relief operations
Early Warning:	Tracking potential emergencies and natural disasters as they develop
ReliefWeb via Email:	Making ReliefWeb available to those without web access
Central Register:	A directory of disaster management

	resources available for humanitarian assistance
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Table 2. ReliefWeb Resources

ReliefWeb focuses on providing high content in a relative low-tech format. They make use of intuitive interfaces and taxonomies, with little bandwidth spent on graphics. Figure 2-5 shows ReliefWeb's homepage, Financial Tracking System and Directory of Humanitarian Organizations.



Figure 6. ReliefWeb

ReliefWeb is an impressive example of the use of technology to share critical humanitarian information. In all, it provides services to users in over 170 countries. According to their own statistics, they process request for over a half a million pieces of information on a monthly basis. This information takes the form of maps, documents and financial support regarding 21 CHEs and more than 1000 natural disasters. (Ibid) With the increasing reliance on

technology, ReliefWeb will play an even greater roll in future emergencies.

2. The Virtual Operations Coordination Centre - VOCC

a. Background

The United Nations Disaster Assessment and Coordination (UNDAC) Team, working under OCHA, generally establishes an On-Site Operations Coordination Centre (OSOCC) as soon as possible following a major disaster. The OSOCC is used to assist the local authorities of the affected country with the coordination of international relief. It provides a place to consolidate information and develop an informed assessment for follow-on planning.

In 2000 the International Emergency Response Consultative Mechanism (IERCM) recognized there was a need to take the information consolidated and produced within an OSOCC and make it readily available to a wider group of decision makers. If local and international actors could have timely access to information, it could reduce the chance for redundancy of effort and wasted planning. This began an initiative known as the Virtual Operations Coordination Centre.

The Virtual Operations Coordination Centre was established and is maintained by the Field Coordination Support Unit (FCSU) within OCHA in Geneva, Switzerland. Its primary role is to aid urban search and rescue teams exchange information during the early stages of a large disaster. It allows information sharing when conventional means, such as telephone and fax, have been disrupted. The Virtual Operations Coordination Centre strives to "create a

real time communication vehicle for use during emergency response." (25) It accomplishes this by acting as an online tool to enable information sharing between international relief organizations.

b. Functionality

The Virtual OSOCC provides a complement of asynchronous tools and database access. Users can access information relevant to a particular disaster, participate in discussion groups or find out about various training opportunities.



Figure 7. Virtual Operations Coordination Center

The Virtual Operations Coordination Centre is a tool specifically designed for disaster management experts. The target audience for the Virtual OSOCC is a professional core of disaster personnel that consists of the International Search and Rescue Advisory Group (INSARG), the International Emergency Response Consultative Mechanism (IERCM) and members of the United Nations Disaster Assessment and Coordination (UNDAC) Team. Access to the

Virtual OSOCC is restricted to these individuals or on a case-by-case basis.

F. SUMMARY

The underlying issues that spawned the CIMILink project back in 1996 are still very relevant today. This is clearly evident in forums such as the Virtual Diplomacy Initiative (2000) and the Symposium on Best Practices in Humanitarian Information Management and Exchange (2002). Although we still wrestle with complex cultural issues and the challenges of coordination, technology has demonstrated its capability in moving us closer to sharing information and building operational awareness.

III: REQUIREMENTS FOR PROOF OF CONCEPT

Creating a productive collaborative environment requires a delicate balance of technology, knowledge and trust. (26)

A. INTRODUCTION

Requirements development for the "proof-of-concept" information sharing application calls for a definition of the current and desired state of CHE operations. In addition, we need to explain how technology can contribute to the desired state.

In Chapter I we learned about the current state. Organizations involved in CHEs are extremely diverse, each operating with its own agenda and priorities. As a military footprint is established at the field level, communication difficulties among the participants often increase and can produce shortfalls, friction and redundancy of effort. These in turn can result in mutual distrust among the parties. A lack of shared information is a primary hurdle in establishing effective relief efforts.

This chapter details the desired state: movement from a collection of uncoordinated separate organizations that execute their relief responses to a coordinated effort among the organizations as a whole. This thesis is based on the assumption that a technology-supported integrated effort will produce a synergistic effect and outperform the disjointed and uncoordinated contributions of separate organizations.

B. DATA COLLECTION

Our first step in the process of proof-of-concept requirements generation is to determine what type of information needs to be shared. We draw much of our information from the Virtual Diplomacy Series "Taking it to the Next Level" and on our analysis of the personal interviews conducted with relief organization workers actively involved in Bosnia.

1. Conference on Information Sharing

In April 2000, the U.S. Institute of Peace and the U.S. Army's 353rd Civil Affairs Command co-sponsored a conference in San Antonio, Texas. The conference report, "Taking it to the Next Level, Civilian-Military Cooperation in Complex Emergencies," recommends information sharing mechanisms to support advanced planning and program implementation by international entities involved in CHES.

Participants at the conference identified ongoing information needs for both humanitarian and military organizations. Both require accurate and comprehensive information about conditions and activities in the field. Just knowing what information could be exchanged before they come into contact in the field would help manage expectations and reduce suspicions about one another's role during a crisis. Unfortunately, not all information is posted in a central or easily accessible location. Minefield or unexploded ordinance locations, infrastructure damage, military or relief staff rotations are not usually made available to all parties. The lack of notice to the

civilian sector about military rotations was a particularly vexing problem for NGOs during the multinational Stabilization Force in Bosnia (SFOR). There was little, if any, continuity in cooperative relationships and joint projects as a result. As conference participants noted:

Each CHE is different in some respects, but some aspects are similar across crises. One such commonality is the need to acquire, compile, analyze, disseminate, and use information before, during, and even after the emergency. No single approach can satisfy everyone's informational needs, yet there exists in every crisis a core of key information that has wide applicability for all those responding to the crisis. However, despite occasional information sharing, this practice has not been sufficiently institutionalized. Thus, collaboration between civilian and military entities cannot be counted on and is difficult to mobilize at the appropriate time. (1)

The lack of a central collection and distribution point or coordinator of information is painfully evident to in-country nationals as well. Not only are nationals asked by multiple organizations for the same information, they typically do not see a follow-up or coordinated response from these organizations. Failure to share information, catalog resulting assessments, or to update existing assessments, has increased suspicions, frustrations, and apathy among community members toward the international participants. Conference attendees agreed that information sharing with nationals should be given a priority and would go a long way in strengthening performance in the field.

Conference participants also recommended that NGOs adopt common technology platforms and networks. Given their

independent agendas, varied resources, and different operating systems and capacities, NGOs would benefit from a common system with interoperable technology, (headquarters to field and among field organizations and agencies), an intra-operational network, archiving methodology, and backup systems. This set of tools would enable participating organizations to move money away from redundant efforts toward better disbursement of their goods and services.

To arrive at this level of connectivity, relief organizations would have to agree to a common architecture, common platforms, and common networks as well as data standards in terms of inputs and outputs. Since no such open system exists, the report recommends that the humanitarian community develop a robust information-sharing regime among its many agencies, to include commercially off-the-shelf (COTS) equipment that is expected to alleviate the technical challenges of interoperable systems.

Thus, the conference concluded with the following recommendations:

- The creation of an information clearinghouse that is publicly available, interoperable, comprehensive, trustworthy, donor supported, and is the principal repository for humanitarian activity information.
- A communications system that is rapidly deployable anywhere, anytime.
- Off-the-shelf architecture, common templates, and standardized protocols.
- Management by neutral entities (e.g., ICRC or a UN lead agency or its implementing partner).

- A system that is sustainable, reliable, and unclassified, and that "does no harm." (1)

2. Interviews from Bosnia

In July 2001, Major Todd Ford traveled to Sarajevo, Bosnia to conduct interviews with designated representatives from NGO, IO and military organizations. The purpose was to collect additional data to establish the requirements for the proof-of-concept application.

A listing of the interviewees and a summary of each interview can be found in the Bosnia Trip Report in Appendix A. The trip report provides background information on each interviewee as well as a detailed account on topics these individuals felt were critical to the problem of information sharing and coordination during a CHE.

The following information was compiled from these interviews. The content of each interview was categorized into problem statement, information requirement, and technical issues.

a. Problem Statement

The problem statement described by the interviewees mirrored the coordination and information sharing difficulties previously identified in the conference report and those outlined in chapter one. As Goran Tinjic, an Operations Analyst with World Bank, summed up his experience in Kosovo: The "lack of coordination led to an uncoordinated, messy effort. There was total chaos in

the relief efforts." Most agreed that given the current situation, "anything is better than nothing."

b. Information Requirements

The interviewees in Bosnia described the following information requirements during a CHE.

1) The specific mandate of each organization is critical to reducing redundancy and wasted effort and increasing situational awareness. Every organization, regardless of size, needs to post its mandate so that those involved in the relief effort can see who is participating and what the mission is.

2) Human resource and support information regarding the NGOs and their organizations involved in the relief effort are important. Specific information from each NGO should include: the primary point of contact (POC); the skill sets each NGO possesses; the time the NGO will be involved in the relief effort; the background, experience, and expertise of the workers; and the support equipment, (logistics, medical, shelter) that is available.

3) Critical to the relief operation is the ability to locate, track and return to their homes of origin all displaced persons and other migrants. Interviewees expressed a need for a database connected to a website for managing displaced persons with information such as age, medical conditions, family members, home of origin and current location.

4) Often field workers have the best situational awareness of the relief effort. Their information should be consolidated and passed on to all organizations, especially their assessments on medical treatments, food, shelter, and clothing.

5) Information about the infrastructure in the area of operations is needed to understand what capability is available for the relief effort and what needs to be built or supplied to a community to get it functioning again. Examples of infrastructure items are utilities, roads, schools, hospitals and stores.

6) Timely, accurate and updated information to establish situation awareness is critical and would include such things as the location of danger areas, hot spots and safe areas, daily briefings, current maps and locations of organizations in the area, weather information, and local crop information. Providing information on the location of all personnel, organizations, and activities is also essential.

7) Information on communication systems (radio frequencies, phone lines, wireless, computer networks, etc) is important to facilitate coordination.

8) Information on transportation and logistic support enables relief workers to know when, how, and where they can travel and move supplies. By maintaining a central repository, this information could be available to everyone and accessed from anywhere.

9) Background information is helpful before workers are sent to the field. They would find value in having information on the history of the area, the reasons for the crisis, the norms and customs of the people, especially what is considered appropriate or inappropriate behavior, the social and economic context, and the political climate. Most importantly, they suggest collecting and disseminating information on the priorities for aid as seen by the people needing assistance.

c. Technical Issues

Interviewees identified the following technical issues that need to be considered when designing a information technology application for a CHE.

1) Many CHES occur in underdeveloped countries that do not have mature telecommunication infrastructures to support wide area networks. The majority of relief organizations still connect to the Internet and local networks using dial-up telephone modems with an average connection speed of 19.2 kbps. This is a critical consideration for application designs, especially when making decisions about the amount of bandwidth required.

2) Information must be accurate and capable of being updated quickly.

3) The majority of users have computers running some version of a Windows Operating System and application programs from Microsoft Office.

4) The technical training/experience level of field workers ranges from the proficient user down to the completely inexperienced. Some training will be required to ensure an acceptable level of proficiency with the application and hardware tools.

5) Many NGOs lack funds to procure and maintain information technology equipment and to build communications infrastructures.

6) Interviewees recommended that the UN or other neutral third party (contractor) should host and maintain the information system. This would ensure an unbiased perspective to the application and encourage participation and information sharing by all.

7) NGO's range from large organizations to individuals. A system must be put in place that enables everyone to share information equally. As example, an Irishman was working to rebuild some schools outside of a small town. He was not affiliated with any particular organization and used whatever material he could get on his own. He needed access to the same type of information and resources as the larger organizations.

C. PROOF-OF-CONCEPT REQUIREMENTS DEFINED

Based on our data analysis, we were able to define the focus and functional requirements of the proof-of-concept. Our proposed solution is to put in place a formal, unbiased, technological, multi-party tool with a

collaborative interface that would enable data and information sharing. The focus of this system, once built, is at the tactical/field level of operations during the initial chaotic stages of a CHE. In designing such a system, we have defined the following system requirements:

- A listing of the organizations and their mandates involved in the relief effort.
- Points of contact for organizations involved in the relief effort including a listing of the skills, supplies and number of people being provided by each organization and the assets they have available.
- The capability to manage displaced persons, tracking home of origin, current location, family members, sex, age and medical condition.
- The ability to search a database to locate specific organizations, points of contact, needs and requirements of displaced persons.
- Timely and accurate situational awareness information concerning the history, current situation and projected situations for the relief area to include danger areas, infrastructure, safe areas, access routes, media contacts, local authorities and maps.
- A tool to better coordinate and communicate between NGO and military units involved in the relief operation.
- Awareness of logistical needs such as medical, food, shelter and clothing supplies, where they are needed, when and how much.
- Highly mobile, rapidly deployable system, able to interface with a larger more robust system once the CHE reaches a more mature state. Mobile capability would be available with the use of wireless and handheld technologies.

IV. DESIGN CONSIDERATIONS

A. INTRODUCTION

The biggest issue in collaboration among disparate organizations is the ability to recognize a problem, decide what to do about it, and then to act on that decision with speed and accuracy. To accomplish these steps within Complex Humanitarian Emergencies, we must address the issues surrounding structure and communication within and between organizations, the steps involved in the decision-making process and the technological support required for success. We have organized the chapter into two main sections to deal with these issues: decision-making and technical options. The understanding of each and the synthesis of both are critical to the success of this project.

B. DECISION-MAKING ISSUES

In this section we look at group structures and decision-making models. These are important topics because it is not just the activity of sharing information that we are addressing, but it is the ability to use the shared information to make better decisions and take actions which are likely to have a better outcome than if the information were not shared. Our research examines how a collaborative technology or decision support tool fits into and aids the information sharing and decision-making processes.

1. Group Structures

In looking at the structure and organization of the entities involved in a CHE, it is clear that not only must decisions be made within the organization, but decisions must be made between and among organizations. C.W. Holsapple has labeled this inter-organization or multiple group decision process as *multi-participant decision-making* (MDM). (27)

Marakas and Wu built on the work of Holsapple to define the term multi-participant decision-making:

An activity conducted by a collective entity composed of two or more individuals and characterized in terms of both the properties of the collective entity and of its individual members (28).

Along with this term, a system of MDM structures has been classified. Figure 8 illustrates the basic MDM structures which determine the appropriate interaction technique to be used based on the given problem context and the type of participation among the participants and the decision maker (29).

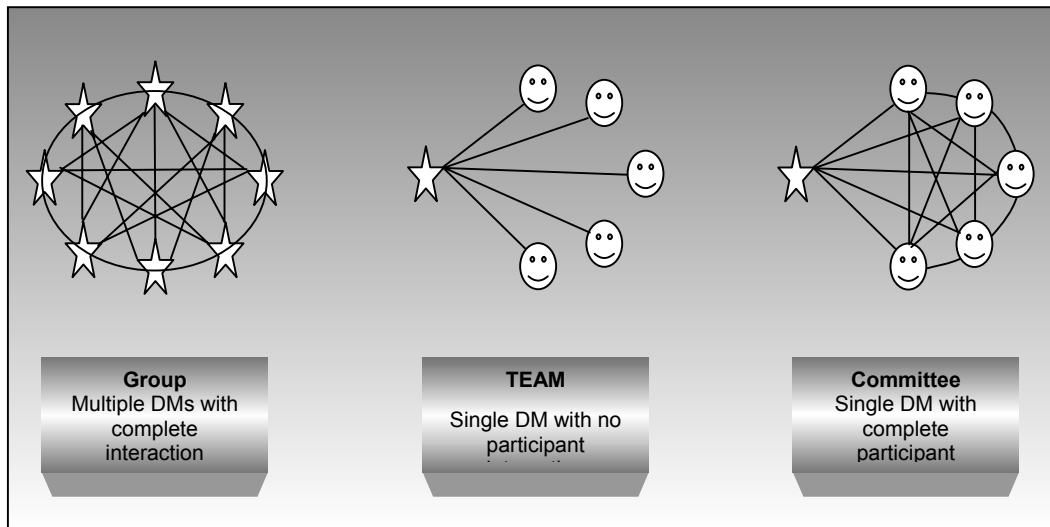


Figure 8. Group Structures (From: 29)

The group structure is classified as a collaborative structure, whereas both the team and committee structures are classified as non-collaborative. The classifications are based on the degree of interaction among the participants and the final product or actions taken.

The team and committee structures are more suited to hierarchical decision-making where participants are provided an opportunity for input into the outcome and actions of the group, but the final decision still comes down to one individual or organization.

It is the group structure that best fits the problem context of a CHE: independent organizations with no hierarchy or structure for interaction with the exception of a common overarching vision—to collaborate and share information.

2. Basic Communication Network Structures

The structure of an MDM is based on the interaction and flow of communication among its members. It also includes the direction and flow of information and the structure of the information stream. Early research done by Bavelas and Leavett established four basic types of communication: (1) the wheel, (2) the chain, (3) the circle, and (4) the completely connected network. These communication structures are shown in Figure 9. (30)

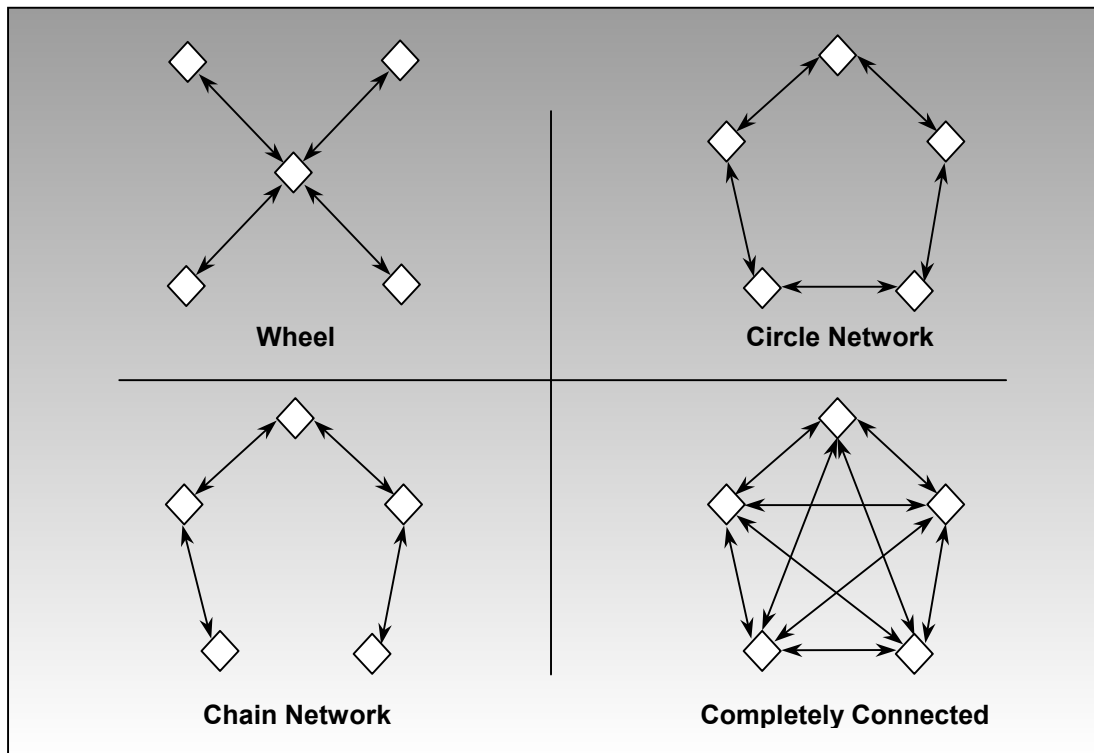


Figure 9. Communications Structures (From: 29)

Each structure has different levels of control and degrees of information exchange and interaction. The completely connected network in Figure 9 maps directly to the group structure that was discussed in the previous

section. This structure, a highly decentralized communication structure, removes all restrictions on interaction among its members. It provides a freedom that is generally very satisfying to its members which in turn leads to acceptance of the group goals and increased motivation for future participation. This network form also has been found to produce more innovative and creative solutions to problem solving. (IBID)

3. Objectives of MDM

Anyone who has participated in any type of group decision-making or inter-organization decision-making knows that it can be a very difficult process, although rewarding if the outcome is positive. The goal of a MDM support technology should be to maximize the advantages of MDM and minimize its disadvantages. Nunamaker identified several of these advantages and disadvantages. (31)

a. Advantages of MDM (goals to maximize)

- The collective has greater knowledge than any single participant
- Interaction stimulates the generation of knowledge or information otherwise unavailable
- Participants can improve individual performance through learning from others
- Group decision-making can produce better results than individual decision-making

b. Disadvantages of MDM (goals to minimize)

- Information overload can occur

- Participants may not be able to remember all the contributions of others
- Pressures resulting in conformity can be exacerbated
- Cognitive inertia or groupthink can result
- Goal displacement can occur—preference for social relations over group goals
- Coordination difficulties can increase

4. Decision-Making Model

One of the goals of a collaboration tool or application is to aid users by providing timely, accurate and coherent information to the decision-making process. This section examines a decision-making model [Figure 10] adapted from Rowe and Boulgarides (32) that provides the foundation for the application presented in the next chapter.

The first step in the decision process is the stimulus. It is at this point that the decision maker perceives a problem that requires a decision and an action. A problem can be simply defined as the perception of a difference between the current state of affairs and a desired state of affairs. If the decision maker perceives that things need to change or conditions need to be altered, then a problem exists. (The stimulus that prompts these perceptions can be perceived differently by individuals. Some may perceive there is a problem while others do not).

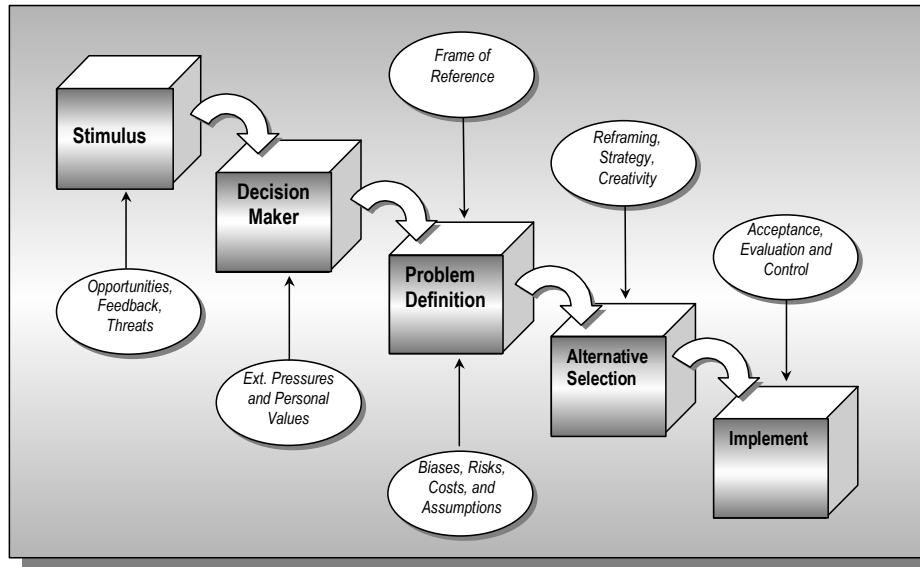


Figure 10. Decision-making Concept (From: 29)

Next we have the decision maker who can be represented by an individual or an organization as a whole. The decision maker is truly a "Black Box." It is difficult to really know what goes on inside a person's head since the thought process is influenced by past experiences, culture, norms, politics and personal agendas.

Putting the first two steps together we now come to the critical stage of the decision process. The problem must be defined before any analysis of alternatives can occur. If everyone perceives reality in the same way and enough information is gathered to create a consensus on the problem statement, then problem solvers can proceed to the next step. If, however, information is scarce and/or the problem definition is contested, then alternatives and solution generation becomes difficult. In this instance, multiple definitions of the problem can surface which in turn can generate multiple alternatives and solutions. Worse yet, some may be implemented. (29) Thus, an

information system is useful at this stage of the decision process to the extent that it can provide decision makers with information to resolve their differences and help them build a consensus on the problem statement.

Once a problem is defined, a decision support tool also can be helpful in generating and selecting alternatives. A decision support tool is helpful here in that it provides the ability to collect and collate information that is relevant to the decision and to the group making the decision. The information can be filtered and presented relative to the context of the problem while providing supporting information for each alternative. The selection of an effective solution from a set of alternatives is the essence of decision-making. It is the decision itself.

Once a solution is chosen, implementation follows. It is at this point that the actions of the organizations and individuals implementing the decision determine the success or failure in addressing the original problem. At this point, the decision support tool should interface with a collaborative tool to enable coordination and communication upon execution of the decision.

5. Technology and Bounded Rationality

A good decision is one that results in the attainment of the objective or objectives within the boundaries and constraints imposed by the problem's context. In other words, if we reach our goal given the limitations of our situation without creating more problems during the process, then we have made a "good" decision. (29)

In an effort to try to gain some insight into the "black box" of the decision maker and to understand how a collaboration and information sharing tool can better assist the decision maker in a less than perfectly rational world, we turn to look at Simon's model of bounded rationality and how it impacts the problem solving and decision-making processes. (33)

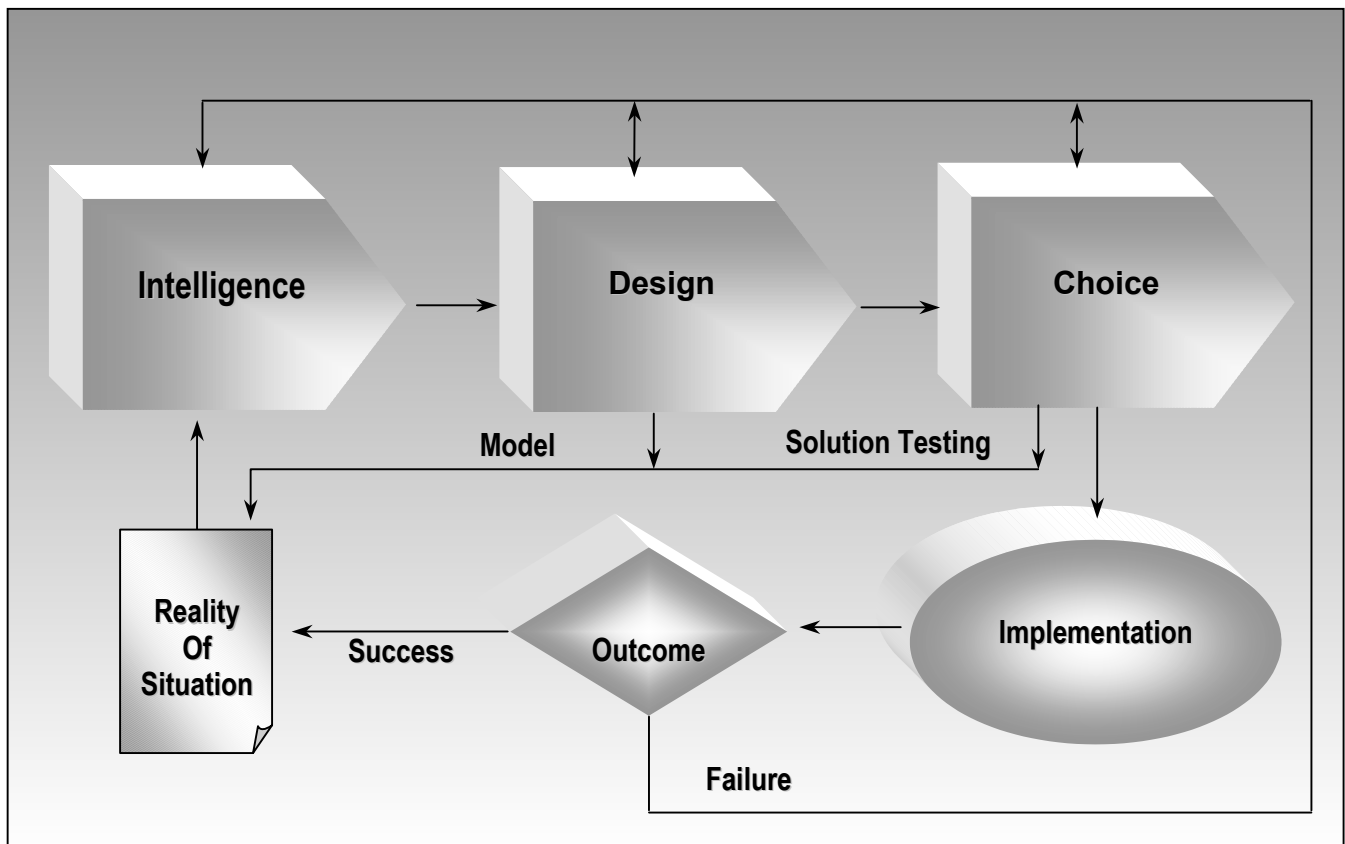


Figure 11. Simon's Model of Problem Solving (From: 29)

a. Intelligence Phase

Simon's model starts with the *Intelligence Phase* in which the decision maker is on the lookout for information or knowledge suggesting the presence of a problem or the need for a decision. It is clear that incomplete or inaccurate information at this stage can lead

to misinterpretations of the current situation, which can lead to incorrect decisions, or the lack of detection of a problem at all. This will be one of the focuses of the collaboration tool designed for the CHE – the ability to build an accurate picture and provide situational awareness both in the general sense and also with respect to inter-organizational relationships where actions may enhance or inhibit understanding.

There is an important premise that Simon makes at this stage. A person cannot own a problem if he/she cannot “see” the problem. If the problem cannot be owned then it becomes a constraint to the system and we are not able to proceed to the next phase of *Design*, leaving the problem unresolved. The reason many problems are left unresolved and handled as constraints is due to the lack of information, which builds an incoherent picture of reality. A good collaboration and information sharing tool will help to increase the percentage of problems which can be “seen” and not left as constraints.

Thus, the intelligence phase can be considered a scanning activity where the decision maker is scanning all information about the current, past and future circumstances to find cues to actions. This type of activity is a perfect fit for a collaboration and information-sharing tool.

b. Design

During the Design Phase the decision maker must begin the activities related to the formation and analysis of alternatives intended to serve as potential solutions to

the defined problem. Most people in large organizations find solutions to decisions based on standard operating procedures (SOPs), policies, and past experience. While these methods can often lead to rapid and decisive action, they also can limit the scope of possible solutions. SOPs are most appropriate for decisions made for day-to-day operations whereas strategic and operational level decisions require more analysis. The collaborative and information sharing tools will assist the individual in each of these situations with the ability to access relevant SOPs as well as more detailed information that is specific to the current situation. The individual will be able to integrate the two in order to design potential solutions to the problem.

c. Choice

Often it is our reliance on heuristics and a lack of complete information that lead to a less than optimal solution. Simon describes this limited view of the situation and possible solutions as *bounded rationality*. (33) We fall back on our comfort zone using heuristics and known alternatives from past experience in almost all cases where a decision has to be made. They enable us to act efficiently, without ambiguity, and in a timely manner in making decisions. They do not always guarantee an optimal solution though. The optimal solution can often be too difficult to implement, be too expensive, too time consuming, or may not even be considered due to our limited way of thinking. Figure 12 (29) illustrates the concept by showing the total *problem space* available when looking for a solution to a problem compared to our search space that

is limited by our bounded rationality. Our bounded rationality limits the options available to us and often blocks out the optimal solution to a problem.

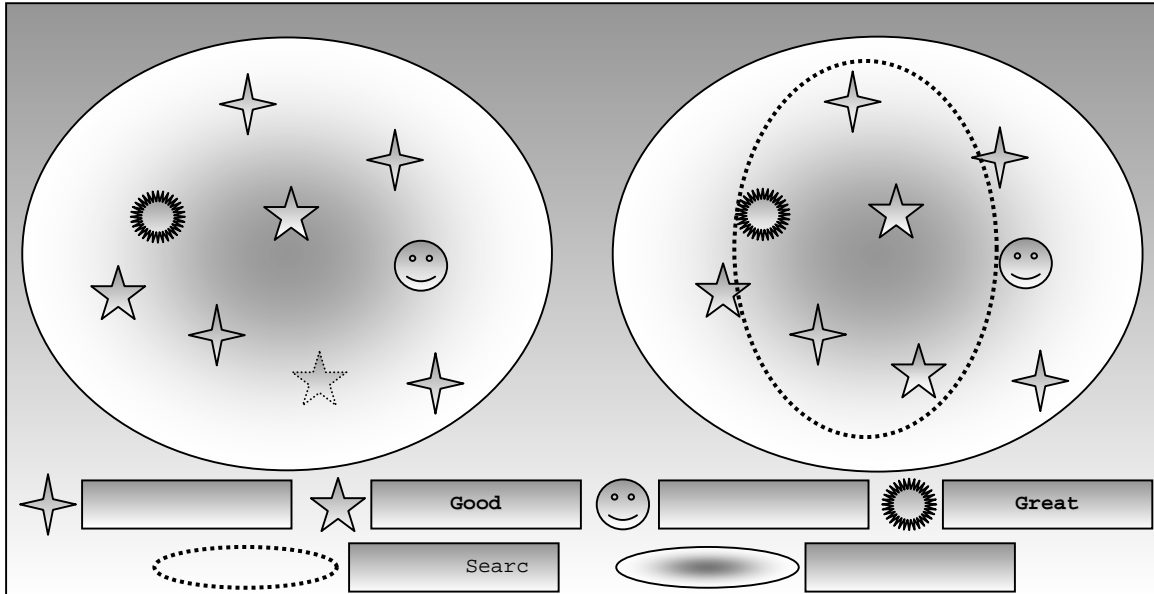


Figure 12. Problem Space and Search Space (From: 29)

It is the goal of the collaboration tool to help expand the decision maker's limited view of the search space to closer match the entire problem space. By presenting ideas and information from multiple organizations and decision makers, the search space is expanded to include more opportunities for an optimal solution, enabling the satisfaction of the entire group, not just a single entity of the group.

Collaborative tools can also be helpful in making choices among alternatives. Although senior ranking officials usually make a decision, their choices often depend on who has the loudest voice, the most experience, or what position people hold. Collaborative technologies can help level the playing field by allowing multiple

perspectives and opinions to be heard regardless of status, rank, or authority. Furthermore, collaborative technologies provide different types of voting systems, some of which are anonymous, giving everyone an equal chance for input into the deliberations.

In addition, in many day-to-day problems and real world contingencies, *time* becomes the limiting factor and a constraint on our ability to include everyone and to test alternative solutions. By having a communication tool, which keeps all members of the group, informed on the alternatives selected and why, group members are able to feel more a part of the decision-making process and the plan being implemented.

d. Implementation, Outcome and Feedback

Once a choice of alternatives is made and implemented, an outcome results. That outcome can be a successful or unsuccessful resolution to the original problem. If the outcome is failure, we need to return to any one or all of the prior phases to determine a new solution and repeat the process.

Although the collaboration tool will not be used as an implementation tool itself, it is a critical component of sharing the information about what the plan is, how, when and where it will be executed, who will be involved in the plan and who will be affected by the plan. This type of information is critical to a cohesive effort in coordinating each organization's activities.

C. TECHNICAL ISSUES AND OPTIONS

In the previous sections we discussed the processes and hurdles associated with connecting people and organizations and making decisions. In this section, we examine the technical aspects to support the process. It briefly covers technological theory on computing power and connectivity, creating value with technology, basic collaborative technology and applying technology to relief efforts. More specifically, it focuses on the issues that surround collaboration over information networks and how these networks can be implemented to support relief operations.

One of the most important potential uses of technology is in the area of relief operations. It can be used in such a way as to allow the organizations involved to focus the relief supplies and efforts on the most critical points. This capability has been addressed, but as we have seen in earlier chapter, it has yet to be fully realized. In the following sections, we address some of the more salient aspects of the technology that have to be factored into an information sharing system.

1. Networks and Network Architectures

a. Evolution of Technology

Moore's and Metcalfe's Laws are the foundation for the continuing evolution/revolution in information technology and network connectivity. Just in the last decade, we have seen capabilities for processing, storage, connectivity, portability and interoperability of

information sharing devices increase while the costs have been falling. If we were to go back to the beginning of technological development in the 1950's, we can conclude that the evolution of technology has occurred in five phases. These phases can be summarized as follows:

First	1954-1963	Isolated Machines
Second	1964-1976	Mainframe Access
Third	1977-1984	Midrange computers with easy interfaces
Fourth	1985-1996	PC, LANs, and WANs
Fifth	1997-pres	PDAs, mobile computing, and the Internet

Table 3. Phases of Technological
Development (From: 34)

As we continue along in the fifth era of technology, companies are reengineering their operations, networks are becoming more flexible, connectivity abounds and management models are adapting to new technical capabilities. Technology is now a vital part of our daily lives and impacts how we interact with each other at work and at home.

b. Networks and Connectivity

The currency of the modern world is information. Today, most information (both voice and data) is transmitted over phone lines (plain old telephone line - POTS), which are a part of an infrastructure that the phone companies created years ago. This nationwide and worldwide infrastructure has become the foundation of the Internet

and other modern networks. Today, everyone with a phone line can access the Internet and other networks as long as they have the proper access.

The need for increased connectivity has been a direct result in the popularity and accessibility of personal computers, cellular phones and handheld wireless devices. Additionally, future packet switched networks will allow for expanded connectivity. They will permit more nodes to exist on smaller networks and extended computing ranges as networking technology continues to develop. Both data and voice will share the same network, freeing up connections for additional information transmission. We may soon see ourselves wearing our computers and phones and maintaining constant connectivity regardless of our location or environment.

c. Network Architecture

Along with the communication method (circuit versus packet switching), the type of network architecture used may impact the level of connectivity of the network. Networks are the basis for communication within any organization. The Internet itself at its most basic is simply a very large network. Intranets are also networks but are private networks that may or may not be connected to the Internet. These smaller, but no less capable networks, are the basis for interactions within and among organizations.

Designing networks can be a challenging undertaking. There are several things to consider. The network architecture is the primary one. The Internet is

based upon the client-server model which is a popular and well supported architecture, however it is but one of two primary types of architectures to choose from when designing a network: client-server and peer-to-peer (distributed).

Client-Server Architecture. Client-server is the most popular version and is widely supported with hardware and software. In general, the client-server model is more structured than distributed (peer-to-peer) computing models. In this model a client computer sends requests to servers to execute tasks. These tasks may be just to provide information, or to perform some sort of computation. The clients and servers are asymmetric, and servers may be clients of other servers. The client-server model relies upon a server to having all of the information and the client accessing the information via an intranet or the Internet. The back-end consists of the server and the database. The front-end is the HTML web page that appears on the user's computer and allows them to interact with the database.

Summary of Client-Server Advantages and Disadvantages:	
<u>Advantages</u>	<u>Disadvantages</u>
Scalable	Hard to build
Modular	Unstable
Easily supportable	Creates dependency on network
Central storage and backup	Vulnerable to excess workload
Easy access	Hard to test
Centralized control	Difficult to upgrade
Centralized services	

Table 4. Client-Server Advantages and Disadvantages (After: 35, 36)

There are several advantages of using the client-server model. It is easily scalable. If properly designed, users can be added or deleted with relative ease with little impact upon network performance. Modularity is easily achievable in that new capabilities also can be easily added without degrading the network or impacting individual users. It is widely supported and can be used with current hardware and software configurations. Client-server networks can exist in one or several geographic locations allowing for a distributed environment. It provides for increased processing power on the server, which reduces the load on the client computers and provides a centralized location for data access, storage, and backup. (IBID)

There are also several disadvantages to using the client-server model. These networks can be hard to build. They require significant capital investments for hardware, software and personnel support. Additionally, they can be unstable during periods of increased workloads and have well-known security flaws. Client-server networks can

create dependency on the network and can significantly reduce productivity when the network is down. Upgrading the network can be an issue and can impact network availability. (IBID)

Peer-to-Peer Architecture. In contrast, peer-to-peer (distributed) network operating systems allow users to share resources and files located on their computers and to access shared resources found on other computers. There is no dependence upon a central server computer. However, they do not have a file server or a centralized management source. All computers are considered equals on the network. Each has the same abilities to use the resources available on the network.

Summary of Peer-to-Peer Advantages and Disadvantages:	
<u>Advantages</u>	<u>Disadvantages</u>
Concurrency	Consistency
Easily scalable	Complexity
Good resource management	Few tools available
Efficient operation	Not easily adaptable
Bandwidth management	Control
Less expensive	Security
Easy to set up	

Table 5. Peer-to-Peer Advantages and Disadvantages (After: 36)

Peer-to-peer networking provides many advantages. Like client-server networks, peer-to-peer networks are easily scalable. Users can be added with relative ease. Since files are easily shared, concurrency is less of an issue since there is no need for updates to a single data storage file. Bandwidth requirements of the network are

easily managed since resources can be easily manipulated and placed closely to where they are needed. Peer-to-peer networks are less expensive and easier to set up.

Peer-to-peer networking also provides many disadvantages. Consistency can be a problem since files can be shared and manipulated by more than one user. There is no simple way to ensure everybody's view of the data is the same. Communications methods can overwhelm the network if the approach is too complex. Supportability issues arise with a lack of common usable tools and. Adapting peer-to-peer models to client-server architectures is not always simple or desirable.

The main issue with peer-to-peer networks is security. There are many more places in a peer-to-peer network where security can be breached. If you access one of the peers you have accessed all of the peers it is connected to. However, this may enable a greater ability to isolate security breaches and avoid catastrophe. Another issue is control. There is less central control, but more local control.

While there is generally only one type of client-server architecture, there are several types of peer-to-peer architectures. (37)

- Atomistic: This is the truest peer-to-peer architecture because it involves direct client-to-client connectivity with no server present. There is no server present and therefore no method of creating communications links based on data availability or user identity.

- User-centered: This method utilizes a directory to provide a way for users to make connections with other users on a network.
- Data-centered: This approach allows users to search and access data held on other users' systems.
- Web Mk 2: This is a combination of the atomistic, user-centered and data-centered models. The multiple directory services provided link users together on an ad hoc basis. While multiple indexes allow access to different forms of data regardless of whether it is on a server or a client.
- Compute-centered: In this approach, an application's processing is divided among multiple clients and a server is used to coordinate the distributed processing. This is not the same as parallel processing in that nodes are spread over the Internet and can be accessed on an as-needed basis.

The technology is available to ensure our connectivity at most any time and at most any location. But wherein lies the true value?

2. Information Technology

We are at the point in history when we can get technology to do just about whatever we want it to. We can be connected to each other at most any time and at any place. But what is the true value of this connectivity? We can measure it with Metcalfe's law, but that measurement is limited only to the number of nodes (connections). How then are we to judge technological value? In the past, the power or value of IT has been in informing or providing

access to information. However, the focus of IT in the future must be on creating value or creating knowledge.

a. Value Creation Model

How do we create value? First, we must define what value is. Value can be defined as something that is useful, important or desirable. But these traits give value a perspective. Each person, entity or organization may have a different view of what value truly means to him/her. Therefore, we can conclude that value can be created along many fronts: economic, physical, emotional, social, cognitive or political depending upon the requirements of those who are evaluating it. However, value within information technology, regardless of the perspective, must contain three aspects: information assimilation, degree of collaboration, and a common methodology. These aspects are mutually supportive and must be developed simultaneously in any attempt at creating value. They are discussed below. (38)

Information Assimilation. This is the most basic of the technology requirements. The information must be made available to those who need it. It must be timely, accurate and complete and not take much time or effort to collect and understand.

Degree of Collaboration. The collaborative ability of the organization must be focused in such a way as to support their combined efforts toward a common goal. The technology must be configurable to the specific team

and need. Organizational teamwork can be broken down into the following types:

Collective efforts	Uncoordinated individual effort, similar tasks, productivity of the group is the sum of the individual efforts
Coordinated efforts	Coordinated individual effort, differing tasks, productivity of the group is the sum of the individual efforts and the degree of coordination
Concerted efforts	Coordinated group effort, differing tasks, productivity of the group is achieved via perfect timing

Methodology. The method by which an organization reaches a decision and takes action must be properly documented and integrated within the technology used to support it. Methodologies focus on the repeatable processes that may aid in creating value. Basically, a methodology can be generally summarized in two basic forms, reason and action.

Reason	This refers to how the organization or team begins to understand the problem, develop alternative solutions, evaluate alternatives and begin the plan for action.
Action	This is the amount of expend effort toward the goal which includes coordinating action, monitoring the results, adjusting the plan and controlling the resources

b. Data Manipulation

Figure 13 illustrates the objective of data collection and dissemination. At the foundation of the figure, multiple types of raw data are input into the database from multiple sources. As an example from a CHE scenario, this data could include descriptive data about participating organizations and individuals, their contact information and mandates, data on refugees and data for requirements such as type and location needed.

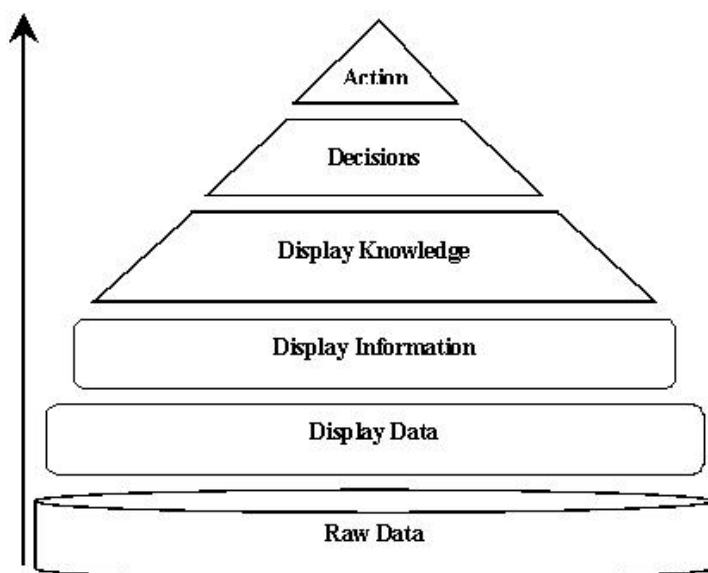


Figure 13. Objective of Data Collection

At the lowest level of display this raw data is simply displayed to the user without any manipulation. (i.e. what went into the database is exactly what is displayed to the user.) The display of this data can be done through a web-based interface or other type of application built specifically for this data.

At the next level we have the creation and display of information. At this level the raw data is combined with and manipulated in a relational way with other raw data that is in the database. The data to be manipulated and displayed can be based on input from the user or automated reports built into the system. The display of information at this level allows the user to build a better picture of the total situation in regards to the interrelation of the different categories of data. The "information" level allows us to build a coherent picture from multiple sources of raw data, input from multiple entities from geographically separate locations.

The final level of information display is knowledge. This level is the essence of a decision support system. One look at the knowledge displayed to the user at this level and he/she should be able to make a decision, which leads to correct action. The knowledge display does more than just provide the user with situational awareness. It notifies the user that action either does or does not need to be taken. It can actually make the decision for the user or notify the user a decision needs to be made to complete the action.

As a basic example of how knowledge is used for decision support we will use the example of the materiel needed to care for people located at a refugee camp. Based on the number of men women and children at the camp, it will require logistics support and inventory for food, water, shelter, clothing and medical supplies. As the number of refugees at the camp changes and as inventory of these supplies changes, decisions will have to be made for

reordering, storage and transportation of this inventory. A decision support system can present this as knowledge to the user; constantly monitoring the total need based on the number of refugees versus what is on hand in inventory versus what is expected to be delivered or on order. If the system detects that the amount of food on hand will only last for another week, then a notification will be displayed to the user who then needs to take action. In more advanced and well-integrated systems, the decision support tool will actually take action on behalf of the user by placing the order for more food by itself.

c. Value of Connectivity

Now that we have seen what is required to measure and create value in a network, we can begin to appreciate that one-person can only process and retain so much information. However, the connectivity of individuals within a network expands the capability to process and retain information. This combined capability to process information is called organizational "intellectual bandwidth". This is defined as "the collective potential to acquire information, make sense of it, and take action with respect to a goal." Connectivity is the real value of a network. (38)

3. Collaborative Technology

The potential of a network to enhance "intellectual bandwidth" (38) has created a demand for collaborative technology. Organizations appreciate the fact that connecting their teams and individuals will enable them to

perform better. They want to use the connectivity to tap into the potential benefits of having a network. The advantage of the network relies upon the ability to collaborate and communicate within the network. Collaborative technologies provide a method of tapping into that potential.

The intent of collaborative technology is to provide a medium within which people may coordinate their individual activities regardless of their location. This is a powerful capability, however coordination of activities requires time for interaction. Subsequently, one of the main focuses of collaborative technologies is to provide a means of coordination that requires little time but increases access to pertinent information.

a. Multi-Participant Communication Tools

The trend towards collaboration is accelerating in today's organizations. This trend is being fueled by a proliferation in technology, geographical dispersion, competition and a desire to find ways of being more effective and efficient. The term *groupware* refers to MDM technology focused on the collaborative processes among people. If employed correctly, it will positively impact the way people communicate with each other, resulting in improvements in the way people work and the decisions they make.

The concept of any groupware or collaborative technology is the ability to develop and preserve the *organizational memory*. (39) The information gathered in the process of conducting business must be captured and stored

in a manner that allows ease of access for present and future decisions.

There are several types of classifications of groupware. These include:

- Messaging Systems
- Conferencing Systems
- Collaborative Authoring Systems
- Group Decision Support Systems
- Coordination Systems
- Intelligent Agent Systems

Each of these systems provides a unique capability, and while they can be implemented as stand alone systems, the better collaboration products incorporate some features from all of these classifications.

Common to most all of these applications is the ability to communicate and share information. The type of communication process a system utilizes is characterized as either asynchronous or synchronous. Asynchronous communication allows for communication separated by both space and time, while synchronous communication allows for communication separated by space and occurring at the same time. A more detailed discussion on this topic follows later in this chapter.

b. Coordination Requirements

The ability to coordinate in a collaborative virtual environment has many elements: communication, information sharing, information privacy, membership control, abstraction, and the ability to create value.

Communication and information sharing are often broken down into two main categories: asynchronous and synchronous communications. Asynchronous communication allows for communication separated by both space and time, while synchronous communication allows for communication separated by space but occurring at the same time. There are several methods that can be used to achieve each of these.

Asynchronous communication occurs when participants are logged-on at different times. They are summarized in the following table.

E-mail	The earliest, and still the most common method of communication over the Internet. E-mail is text-based and therefore even the most basic computers and Internet connections will support it.
Mailing List Managers (Listserve)	Mailing lists provide an automated system for distributing e-mail to a pre-determined group of users. There are thousands of mailing lists on any number of topics available today. Mailing lists can be vetted by a moderator or can be open.
Usenet Newsgroups	This type of asynchronous communication uses technology similar to e-mail. Messages are created using special software and the messages are sent to a central server that posts them where everyone can read them. It is different from e-mail in that the messages do not go to each individual's mailbox, and the messages can be posted according to particular topics. This way, messages can be organized for the reader.

Threaded Discussion Groups	Threaded discussion groups (also called computer conferencing) store text-based comments on a central server. Comments are organized by topics within a discussion. Participants can login to the discussion group and read comments and post responses. Unlike e-mail or Newsgroups, the comments remain visible once they have been read.
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Table 6. Asynchronous Communication Methods
(From: 39)

Synchronous communication occurs when participants are communicating in "real-time". Everyone is logged in at the same time. They are summarized in the following table.

Chat Groups	Chat groups provide a system for real-time discussion. Participants communicate or "talk" by typing text. The software indicates who is speaking. Chat software often allows participants to create virtual "rooms" for specific topics of discussion. Some chat groups use Avatars, which are graphical personalities that participants can assume as they chat. Some graphical chats also provide graphics for illustrating facial expressions, thoughts and feelings.
MUDS/MOOS	MUDs (Multi-User Dungeons) and MOOs (MUD Object Oriented) are virtual worlds with rooms, situations and characters. They were initially patterned after the game Dungeons and Dragons.
Computer Conferencing	Web-based conferencing tools can include text-based chats, as well as audio, video, application sharing, and shared white boards. These conferencing tools allow users to see and hear other participants. They can also edit or annotate the same files, draw on a shared whiteboard or browse the web together.

Table 7. Synchronous Communication Methods
(From: 39)

Embedded within the need for coordination is also the need to share information. Information sharing is the other main strength of Web-based technology. The World Wide Web and the Internet facilitate the publishing of content, file sharing, database and other application access, as well as sending information to the desktop or push technology. On an organizational level this web-based technology is implemented on a private Intranet, which can be limited to operational participants only. More details can be found later in this chapter.

Information sharing can take many forms, including the requirement for feedback. Timely and accurate feedback will enhance the CHE participant's ability to coordinate. Information can be delivered to the desktop or it can be requested from a remote database. It also can be presented on a single web page or on a series of linked web sites. Table 8 summarizes the types of information sharing.

Publishing	Any time information is put onto the Internet or an Intranet either in the form of web pages or text files for viewing; the information is being published. Web pages can contain graphics, text, audio, video or animation. There is no limit to the kinds of content being published on the World Wide Web today. The World Wide Web is both a display and a navigation tool. Well-designed web sites provide a way for users to selectively browse through published information in an organized manner.
Broadcast Streaming	The technology now exists to deliver live radio broadcasts over the World Wide Web. This same technology can also be used to archive broadcasts for asynchronous use.
File Sharing	FTP (File Transfer Protocol) is one of the original Internet applications and is still widely used today to transfer files from one computer to another. FTP is used to update files, to share free software, or to distribute clip art or audio or video files.
Application access	Application access provides the remote users with the ability to use software that resides on a local server over the Internet. Online access to databases is the most prevalent example of application access across the Internet. It is possible to query databases on remote computers, and in some cases to retrieve full-text documents.

Table 8. Types of Information Sharing
(From: 39)

In addition to information sharing, there is also the need for privacy – information that will not be shared or that needs to be protected. The need to share and the need to protect are not mutually exclusive, but are they are not necessarily mutually supportive either. These are

two important issues to resolve, especially in peer-to-peer networks.

c. Abstractors

Abstractors are functions that relate data in a summarized fashion. They provide a simplified view of a system, which contains only the details that are important for a particular purpose. There are three important abstractors that must be included in all collaborative endeavors: conference, context and participants. (39)

Conferences A roster of participants, the roles of the participants and how they plan to communicate

Contexts Focal points for organizing information and can also typically contain a list of participants

Participants Either human or software

In general, abstractors provide the ability to control membership, to organize information and to organize the sharing of information within the collaborative environment.

d. Transactional Versus Relational Communication

A method of communication needs to be selected. The method of communication does not refer to the actual lines of communication themselves (i.e. email, chat, etc.), but rather to the methodology behind the interactions. The communication within the network will support either transactional, relational or both.

The transactional view of communication relies on analytical, engineering approaches, whereas the relational view relies on a humanistic approach. Both are valid approaches to communication, but their use depends upon the context of the communication. Transactional communication involves communication that revolves around some sort of exchange of goods or information between two or more entities within a network. Relational communication involves communication that centers upon the building of a relationship or reliance upon other entities within the network. Some of the differences are summarized in the table below: (39)

<u>Transactional</u>	<u>Relational</u>
Economic	Social-psychological
Engineering	Humanistic
Efficiency, effectiveness	Context
Transaction cost/volume	Emotion, trust, credibility
Task efficiency	User engagement
Task performance	Trust and caring
User friendly	Enjoyability
Efficient information exchange	Mutual understanding
Information modeling	Sociotechnical design
Cognitive mapping	Joint application development
Strategic alignment	Community development
Enterprise analysis	Business process reengineering
Critical success factors	Knowledge management
Standard planning techniques	On-line learning communities
Table 9.	Summary of Table 6.2 (From: 39)

4. Managing Virtual Space

Virtuality is the "communication, interaction, and conducting business through technology rather than face-to-face." (41) It applies to activities within a group of connected individuals that can occur at any time, any place in any way that one desires. It has no physical, temporal or geographical limits.

As with anything, there are degrees of virtualization. Individuals who are members of a virtual team may actually meet face-to-face on occasion or they may not. They may never meet. This can create issues with personal relationships and loyalties. Membership within an organization may become blurred at the boundaries in relationships such as these. Organizations implementing a virtual collaborative environment must be aware of the specific management challenges associated with this approach.

Yet there is value added in creating a virtual space. Advantages are many: creating and managing relationships, projecting images, managing knowledge and creating core competencies, and creating and maintaining communities. (41)

Relationships. Collaborative technology has opened up the ability to create and maintain multiple relationships over vast distances. These relationships can occur between individuals or organizations and can be maintained regardless of location. The primary benefit is in the ability to create and adjust the relationship as the

situation dictates. This is especially powerful in inter-organizational relationships.

Images. The ability to present images in the virtual space is crucial. Images may vary depending upon the circumstance. The virtual space will allow the individual or organization to present an image that is pertinent to the circumstance or target audience. For example, an organization may have different images for employees, partners and customers. Each image is tailored and adjusted for a specific purpose.

Knowledge. The virtual workspace within an organization must be able to create and maintain knowledge. Without this, the network is useless. To be successful in this area, there must be the ability to: construct and maintain a knowledge repository, the ability to share knowledge and the ability to create and maintain a network of knowledge. This can take place in many forms: data mining, data warehousing, decision support systems, etc.

Community. The final method of creating value is in establishing a community within the virtual space. The community allows for users of specific interests or skills to come together to exchange information specifically targeted to their group. They can share information within the organization or participate with similar interests of users in other organizations. The potential gain here is great.

a. Creating Virtual Space

Presentation of the virtual space is critical to creating a usable and effective collaborative environment. In preparation for the creation of the virtual space, the organization needs to decide upon the method of presentation. For this, there are two primary methods to choose from: portals and focused distribution.

Portals are defined as "a doorway or gate". A portal is a tool that aids the user in gaining access to information contained on the network. Portals can either be horizontal (general gateways to vast amounts of information), vertical (focused gateways to specific areas of information) or affinity (similar to a vertical portal but targeted to a specific segment). Focused distribution provides a specific product or service that is targeted to a specific industry or niche. (42)

b. Virtual Teams

In addition to the challenges of managing the enterprise, managing and creating a virtual team is a challenging undertaking. There are several issues, both human and technological, that create these challenges. On the human side, there is people, culture and language, and on the technical side, there is accessibility, reliability and compatibility; appropriate technology use and IT proficiency.

The diversity, social and geographical, that comes along with creating a team within a virtual environment can be tough, however the diversity should become strength. It allows the team to view problems from

different perspectives. In order to fully capitalize upon the strength created from the diversity of the team, there must be cultural training so that each member appreciates the points of view brought by the other team members and is able to communicate their views in the most understandable manner.

Technologically, the team must have compatible, reliable hardware and software. Problems in this area can create high levels of frustration and a lack of confidence in the project. The appropriate use of technology is also important. Proficiency in the primary language or maintaining a structured communication methodology can be very important when dealing with multiple IT cultures. Additionally, the variance in levels of IT proficiency must be addressed. Primarily, this can be mitigated via training. (et al 42)

c. Virtual Boundaries

Virtual environments have been created to minimize the differences in space and time within and among teams. Technology can allow us to achieve this with relative ease. However, this is not always the case. If an environment is not properly designed, it may actually promote differences and reinforce existing boundaries creating virtual fences. This can significantly hamper communication and collaboration. Any development of collaborative or virtual environments must address this issue. It should also be appreciated that these virtual fences cannot be eliminated; they will always exist in some form. They should be integrated within the intended design

and reformed to meet the needs of the project. The designers can reform the boundaries and create strength by aligning the technical and social issues within the project and use the strength associated with each to ensure that knowledge is shared and that boundaries are appreciated and used to the advantage of the organization. (et al 43)

D. SUMMARY

There are many issues and topics summarized in this chapter that affect the design of information sharing systems. They represent important choice points in building any system. Our choices for the design may not be the ones other organizations will select in the future. However, we submit the following design decisions as the first attempt to build a system that provides the greatest flexibility for the widest use possible:

- Supporting different group structures with virtual space
- Totally connected network communication network combining wireless and terrestrial communication architectures
- Web enabled database providing data manipulation capabilities via a web browser for individual access
- Collaboration and communication tool built into a client-server and peer-to-peer architecture
- Combination of asynchronous and synchronous communications via voice and text messaging
- Abstractions of data to summarize information relative to specific areas of interest

We elaborate on these design decisions in the next chapter. We introduce our application called the ROCC and illustrate how the design elements could work together as a total system to facilitate communication, coordination, and collaboration during CHEs.

V. APPLICATION OF TECHNOLOGY TO RELIEF OPERATIONS

A. INTRODUCTION

Chapter III established the requirements for the proof of concept. It called for the development of a central knowledge/information repository that enabled users to manage membership, access and assure information, and collaborate. This chapter translates these requirements into the application called the Relief Operations Coordination Center (ROCC). ROCC is a wireless, web-based knowledge portal and information fusion center designed to link a network of in-country stakeholders. Technologies for the ROCC include the use of relational databases, wireless networking, structured data access using dynamic HTML, and web-accessible team collaboration tools. We describe the specific software and network architecture integrations that are utilized and provide the schema for the database, including detailed discussions of each section of the web-based application, ROCC, and the collaboration tool, Groove, that interfaces with the ROCC.

The functionality described in this chapter is intentionally limited due to the amount of space that a detailed description would require. A hands-on demonstration of the ROCC application will provide much more information on the functionality and usefulness of the ROCC/Groove system.

B. RELIEF OPERATIONS COORDINATION CENTER (ROCC)

The Relief Operations Coordination Center (ROCC) is the name given to the application that is designed to be

the central knowledge/information repository. It is a dynamic HTML-based application that can be used terrestrially or wirelessly and is targeted at field-level personnel.



Its core functionality is a web-enabled relational database that networked users can use to easily access and view information, present it in a number of different formats, and update it as required. The ROCC database and the web pages that interface with it are held on a server to allow greater access and are passed to the client via normal Internet protocols. The web interface provides a common access point and one that is readily recognizable to many users and does not require much training, equipment or software to employ.

The ROCC provides knowledge management capability but it is only one part of the picture. In order to be most effective, it must be combined and integrated with collaborative capabilities. The chosen collaborative tool is 'Groove'. This application is a commercial off the shelf system (COTS) that enables synchronous and asynchronous communication with other members of the network.

C. GROOVE SOFTWARE

Groove Networks Incorporated developed Groove, a software tool designed on the Web Mk 2 model, as detailed in chapter 4. Groove provides instant messaging capability in both data and voice, concurrent file sharing, synchronous communication via voice-over-IP and allows the

user to track messages and the availability of other users on the network as illustrated in Figure 14.

Groove relies upon a server only to control and provide information on network access. The client computers contain the Groove software that enables them to communicate directly with one another. Thus, information is shared strictly via peer-to-peer communication. There is no file server support.



Figure 14. Groove Software

Users can access the ROCC via a normal web browser or while users are inside the Groove collaborative shell, permitting a great deal of flexibility. The Groove software can act as a shell within which the user may access the ROCC application and its database. The ROCC application is the knowledge management tool and the Groove Software is the collaborative tool. Figure 15 demonstrates the relationship between the two applications. Groove permits users to communicate with whomever they choose, a powerful capability that provides ultimate flexibility and access,

important considerations given the geographic separation among the CHE participants, the austere environments in which they operate, and the poor communication infrastructures on which they rely.

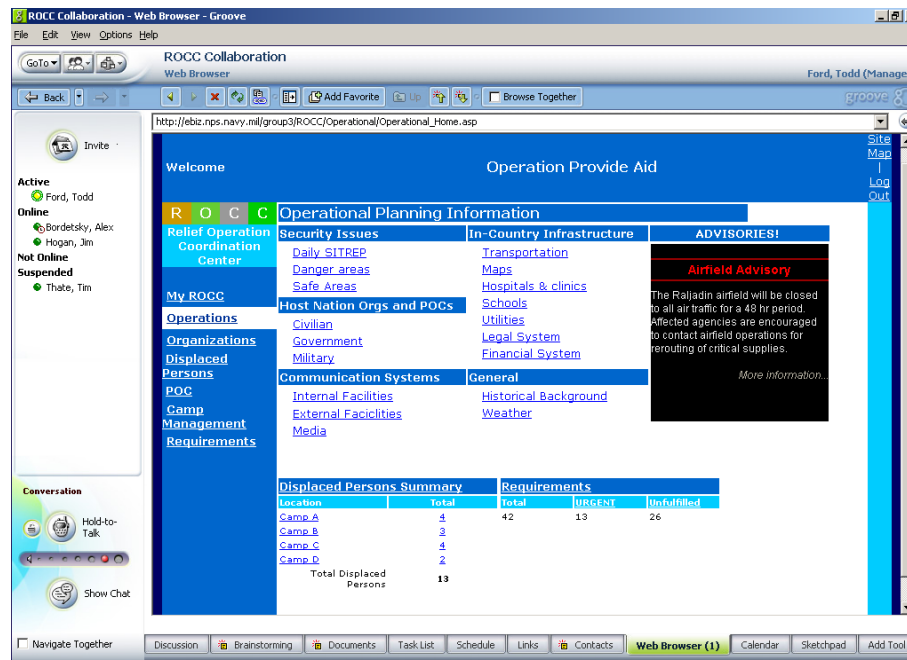


Figure 15. ROCC and Groove Interaction

D. REQUIRED ARCHITECTURE

Naturally, both the ROCC and Groove require a network architecture that will support their operations. However, in their most basic form, the desired functionality of each requires a different form. The ROCC operates using a client-server model, and Groove operates within a peer-to-peer model, both supported in a terrestrial and wireless networked environment. Although the two applications (tools) are technically independent, they have a symbiotic relationship. Users can interact on the peer-to-peer network using the collaborative tool Groove while at the same time take advantage of the client-server network using

ROCC. This arrangement incorporates advantages from both systems while mitigating the disadvantages. Users of this system (Groove and ROCC) will get the following features:

- Centrally managed database
- Centralized file management
- Centralized **file** distribution
- Membership management
- Communication awareness
- Targeted data sharing

Additionally, they need synchronous and asynchronous collaboration and communication among individuals and groups and these features they get with Groove. This combined architectural structure system works well in an ad hoc, informal, virtual, and non-directive setting that relies on trust and the willingness to work together without central authority to provide oversight and control. Groove facilitates transactional and relational communication among the participants. ROCC ensures that their information and activities are aligned so the coordination will be effective.

E. ELEMENTS OF THE ROCC APPLICATION

As stated above, ROCC provides the core functionality. It consists of a web page front end with a database back end. The remainder of this chapter is dedicated to a general description of its elements including the database, the web environment, and its sub-sections.

1. Database-Data Model

The database is currently configured in Microsoft Access and contains eight tables. There are six main information tables: contact, requirement, site, refugee, organization, and meeting, and there are two intersection tables: contact2site and meeting2contact. This database is the main focus of the ROCC knowledge management system.

a. Database-Entity Specifications

The following table summarizes the specifications for each entity in the database.

Entity	Definition
tblOrganization	This table will contain information related to the organizations involved in the operation. This data will be closely linked to the information for contacts.
tblContact	This table will contain information related to individuals involved in the operation. This data will be closely linked to the information for organizations, sites and meetings.
tblContact2Site	This is an intersection table that will link contacts to individual sites throughout the area of operation.
tblMeeting2Contact	This is an intersection table that will link meetings to contacts.
tblMeeting	This table will contain information related to the meetings established by individuals involved in the operations. This data will be closely linked to the information on contacts via the Meeting2Contact table.

tblSite	This table will contain information related to each location established within the area of operations. This data will be closely linked to the information on contacts via the Contact2Site table.
tblRefugee	This table will contain information related to the displaced persons within the area of operations. This data will be closely linked to the information on sites.
tblRequirement	This table will contain information related to requirements at each site. The data will be closely related to the information on sites.

Table 10. Entity Specifications

b. Relational Diagram

The detailed database diagram can be found in Appendix D.

c. Attribute Specifications

The attribute specifications detail the properties associated with each field of each table in the database. This information is too numerous and detailed for the main body of this thesis but can be found in Appendix C.

2. Web Interface

The ROCC is the web interface for the database content. The ROCC is divided up into several areas, each of which is associated with one or more areas of the database. The web interfaces provide much needed flexibility in data manipulation and display.

a. *Web Design Summary*

In general, the user accesses the ROCC via a login page, which establishes a session variable with the server. This session variable is used to tailor the information to the user. The first page the user sees upon login is their "My ROCC" page. (This page is described in further detail below.) From this page, the user is able to navigate throughout the remainder of the ROCC application. There is also a site map available that lays out all pages and functions of the ROCC in one easy-to-view page.

F. ROCC SUB-SECTIONS

The following information is a summary of the functionality that is currently contained within the application. The intent is to provide an overview and to present it in an easily understandable manner. The ROCC is divided into seven main sections, each with its own purpose. The sections are identified and described in further detail below. Each section is linked to the others to provide smooth navigation of the site.

1. Personalization (My ROCC)

Most effective web portals allow for personalization of some sort. This application **allows the user to view** information that is specific to him/her and to get information quickly and accurately. Figure 16 illustrates one personalized web page.

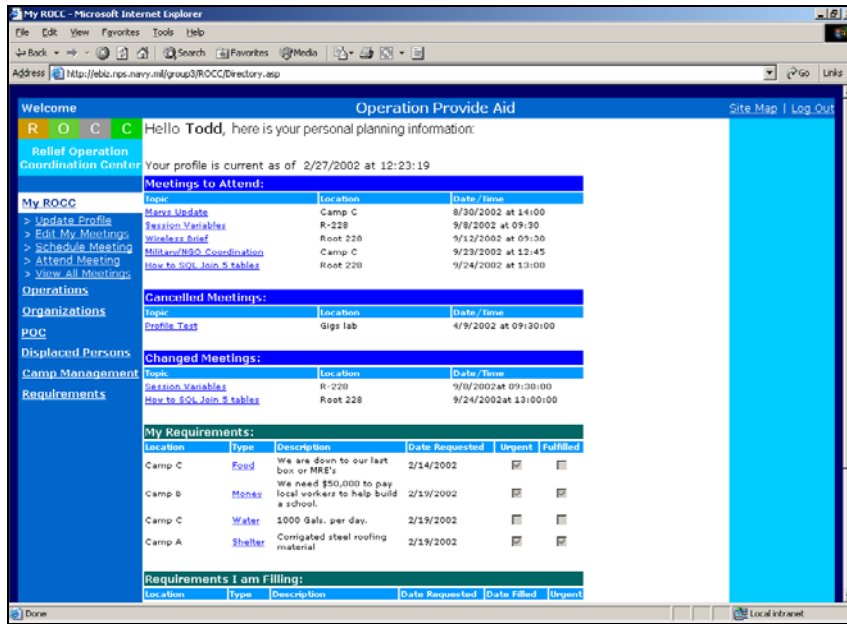


Figure 16. ROCC Personal Page

a. *Displayed Information*

The information displayed on the main page in this section is personalized for each user: the scheduled meetings, the meetings they have created, information on changed or cancelled meetings, requirements that they have created, and requirements that they want to fill. (More information on requirements may be found in that section.) There are also links within this information that will take the user to the applicable section for more specific information.

b. *Available Information*

The information available within this section revolves around the specific user. This section allows the user to: update their profile, edit their meetings, schedule a meeting, view all scheduled meetings, select

meetings to attend, and view requirements entered and fulfilled. Details on each action are as follows:

1. Update Profile. Each user has to enter information when they initially register with the ROCC system. The user can update this information as he/she sees fit as long as he/she are properly logged into the application.

2. Schedule A Meeting. This part of the application allows the user to enter information on a meeting they want to host. This information is contained in the database and made available to other users on their home pages.

3. Edit Meeting. If the user wishes to change information on a meeting that they have already entered in the system, they are able to change the information. The changed information automatically appears on the home pages of other users that have signed up for the meeting.

4. View All Meetings. The user will be able to go to a page to view all meetings that have been scheduled. They will also be able to register to attend the meeting if they so desire.

5. Select Meeting to Attend. This is the same functionality as the previous section.

c. Queries

There are no queries available in this section. However, there are summary reports that are available on meetings.

2. Operations

The intent of this section is to provide a single source of information that is directly applicable to the operation in which the user is involved.

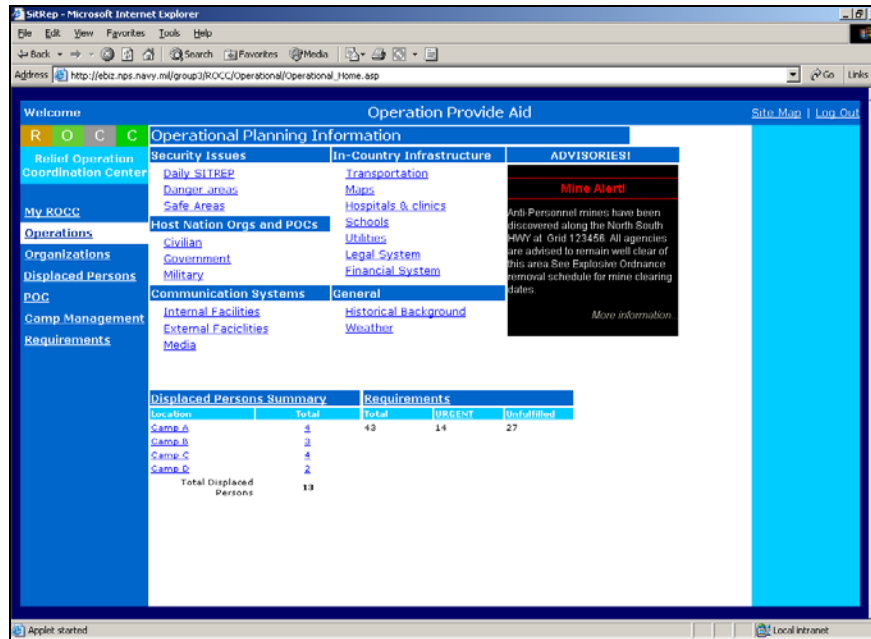


Figure 17. ROCC Operations Page

a. *Displayed Information*

The information displayed on the main page in this section consists of links to detailed reports, a scrolling update screen that contains high-level alerts and summary information on displaced persons and requirements.

b. *Available Information*

The detailed reports available cover: security issues, host-nation infrastructure, host-nation organizations and points of contact, communications infrastructure, and general issues. There are also links

within this information that will take the user to the applicable section for more specific information.

c. Queries

There are no queries available in this section.

3. Organizations

This section provides access to the information on the organizations participating in the operation. The user is able to query and view specific information. The main page of this section has summary information of the functionality of the section and summary details from the database on the number of organizations and personnel participating in the exercise.

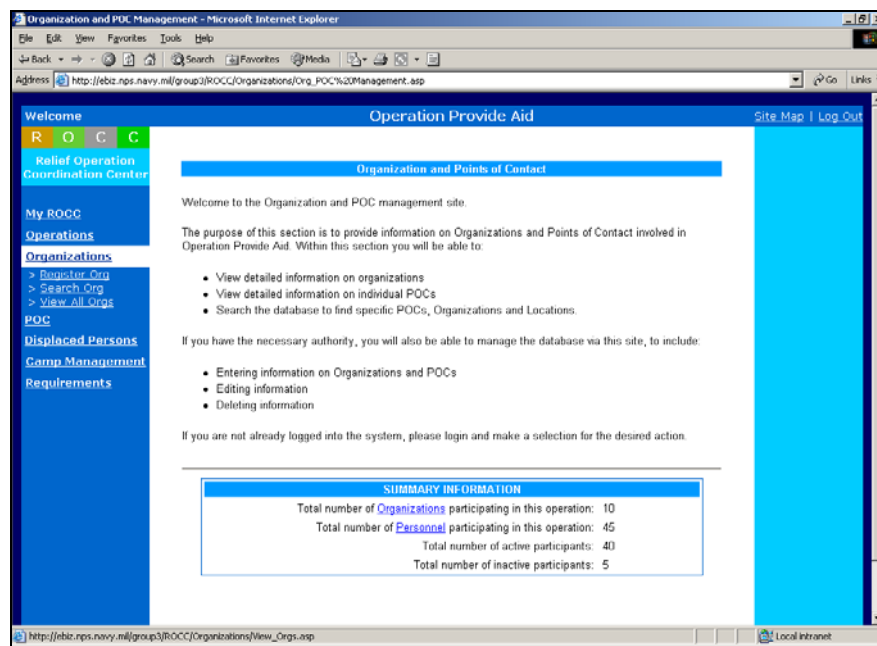


Figure 18. ROCC Organizations Page

a. *Displayed Information*

The information displayed on the main page of this section covers the content and usability of this section as well as some summary information on the organizations involved in the operation.

b. *Available Information*

There are links in this section that will allow the user to add an organization to the database, to query the database and to view a list of all organizations.

c. *Queries*

There is one query page in this section that will allow the user to search the organizational portion of the database by: point of contact, location and organization.

4. *Points of Contact*

This section provides access to the information on individuals participating in the operation. The user is able to query and view specific information. The main page of this section has summary information of the functionality of the section and details from the database on the number of personnel participating in the exercise.

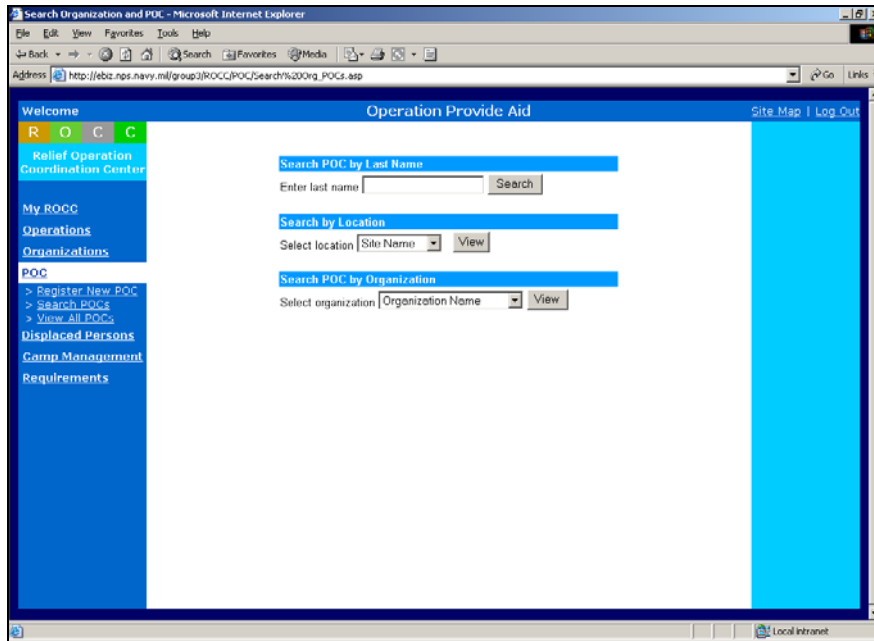


Figure 19. ROCC POC Page

a. Displayed Information

The information displayed on the main page of this section covers the content and usability of this section as well as some summary information on the people involved in the operation.

b. Available Information

Additionally, there are links in this section that allow the user to add a POC to the database, to query the database and to view a list of all POCs.

c. Queries

There is one query page in this section that allows the user to search the POC portion of the database by: point of contact, location and organization.

5. Displaced Persons

This section provides access to the information on displaced persons in the area of operation. The user is able to query and view specific information. The main page of this section has summary information of the functionality of the section and summary details from the database on number of displaced persons in the operational area.

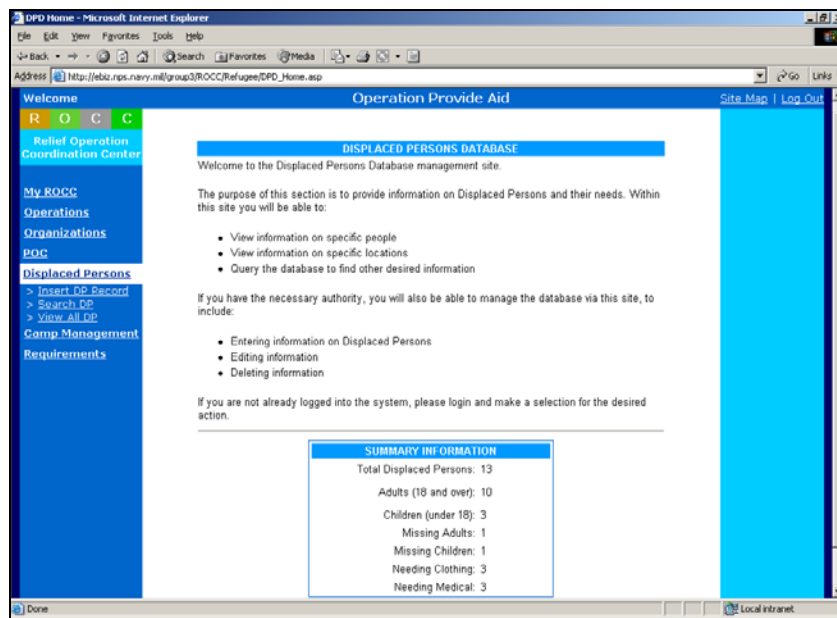


Figure 20. ROCC Displaced Persons Page

a. Displayed Information

The information displayed on the main page of this section covers the content and usability of this section as well as some summary information on the displaced persons affected by the operation.

b. Available Information

Additionally, there are links in this section that allow the user to add a displaced person to the database, to query the database and to view a list of all displaced persons.

c. Queries

There is one query page in this section that allows the user to search the displaced persons portion of the database by: name, location, age and home of origin.

6. Camp Management

This section provides access to the information on camps in the area of operation. The user is able to query and view specific information. The main page of this section has summary information of the functionality of the section and details from the database on number of camps in the operational area.

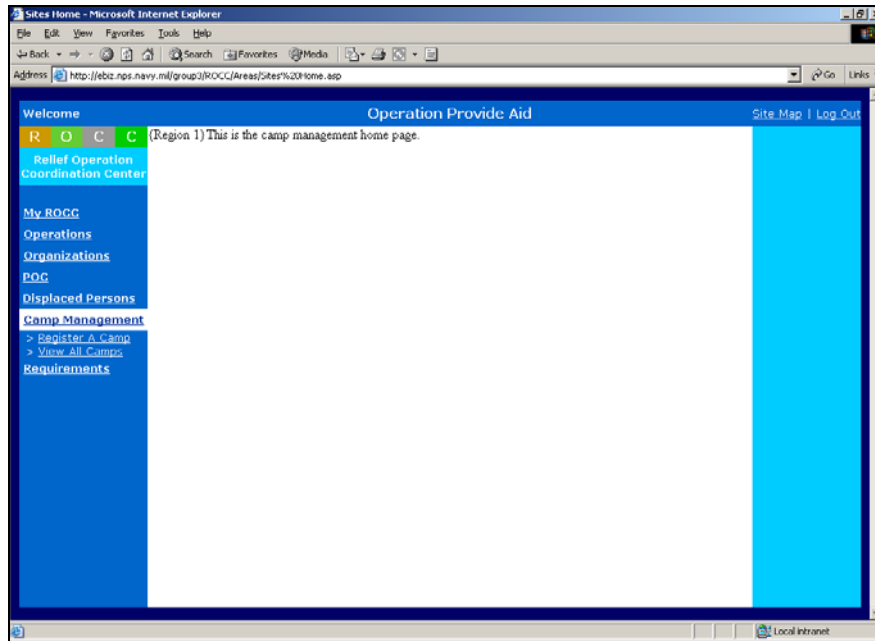


Figure 21. ROCC Camp Management Page

a. Displayed Information

There is currently no information displayed on this page other than available links to section functionality.

b. Available Information

Additionally, there are links in this section that allow the user to add a camp to the database and to view a list of all camps.

c. Queries

There are no queries in this section.

7. Requirements

This section provides access to the information on the requirements in the entire area of operation. The user is

able to query and view specific information. The main page of this section has summary information of the functionality of the section and details from the database on the number of requirements in the operational area.

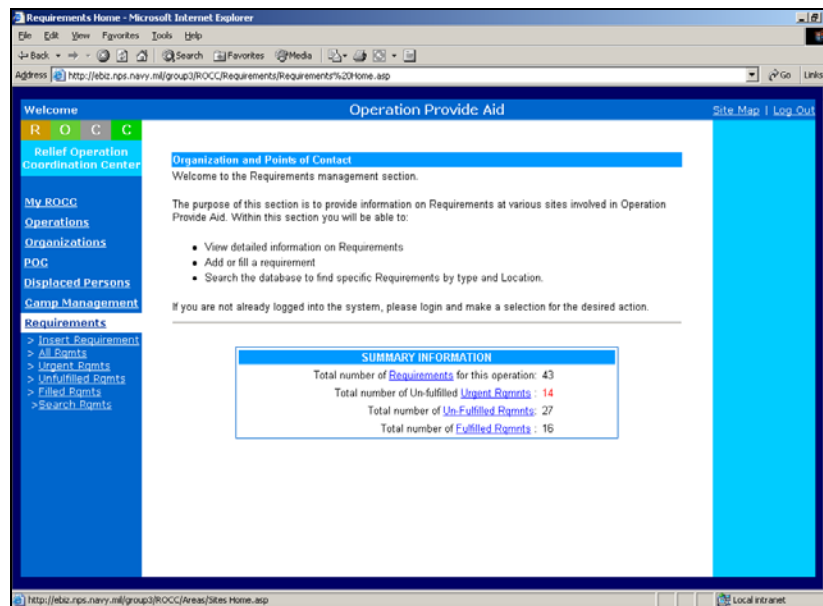


Figure 22. ROCC Requirements Page

a. Available Information

Additionally, there are links in this section that allow the user to add a requirement to the database, to view all requirements and to view who requested and fulfilled the requirement.

b. Queries

There are several queries in this area of the application. The user can get standard reports on: urgent requirements, unfulfilled requirements, filled requirements. The user can also query the database to get

information by: date, requirement type, location and requirement type by location.

8. General

There is a site map that provides a complete overview of the site for ease of navigation.

The ROCC in its current form is incomplete. There are several areas that need to be addressed and developed. Those items are discussed in the next chapter.

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VI. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

A. INTRODUCTION

In previous chapters we discussed the issues, challenges and value created when connecting people and organizations within virtual networks. In addition, we offered a technical solution to the problems of communicating and coordinating under the difficult conditions of Complex Humanitarian Emergencies. The next step is to build on what we have accomplished and to recommend areas for further research and development.

There are several capabilities that were developed for the first version of the ROCC. These capabilities were pursued because of their importance to the proof-of-concept stage of the project. These capabilities need to be developed further and other capabilities need to be defined and developed. For example, further analysis on the infrastructure requirements must be addressed, integration within the collaborative environment must be improved, and modularity, case-based reasoning and the use of intelligent agents need to be considered.

B. INFRASTRUCTURE

1. Network Architecture

The infrastructure that has been identified as the ideal environment for the interaction of the ROCC and Groove applications is a peer-to-peer network operating simultaneously with a client-server network. The research

for this thesis only lightly identified the reasons for development in this area. It has become apparent that there has been very little work done in this area of technology and that further research is necessary in order to improve the state of collaborative technologies as a whole. There are hardware and software issues that arise when combining these operations, i.e., using the same hardware to run services for both architectures. However, the interaction of the ROCC and Groove provides a good baseline for further research.

2. Network Infrastructure

The intent behind this project has been to provide the capabilities of information exchange in an austere environment. In order to accomplish this task, wireless technologies must be used in conjunction with satellite and terrestrial communication architectures. The options available to design a solution vary immensely; however research needs to be done on specifically how to address this issue in a technically and financially feasible manner. At this point, all available technologies should be pursued, satellite, wireless phones, wireless PDA, handheld computers, local wireless LANs and reach-back capabilities. Future research teams must identify the communications architecture within which the ROCC and Groove applications will operate within.

C. FUTURE ROCC DEVELOPMENT

Chapter V discussed the capabilities of the current version of the ROCC. This section is dedicated to

identifying areas for further development. It presents the requirements as they relate to each section of the current version of the ROCC.

1. Personalization

This is one area that is open to most any idea for additional capability. Personalization is used on most web sites and may be the most useful area of the ROCC in that it can be integrated with the other areas to truly personalize the information based upon the user profile and database access histories.

Examples of potential capabilities are:

- Reports generated based upon user profile, i.e. a camp manager could have a link to a daily report that summarizes several pieces of data for his camp
- Users could be alerted when someone that they frequently communicate with changes locations or contact information
- Alerts provided when requirements arise within a specific user or organizations capability

2. Operations

This may be the most important part of the ROCC in that the information contained here is the important day-to-day information that is used by every potential user in the operation area. Some ideas for development:

- Better integration of digital maps into the web site.
- Method of storing and accessing historical information and reports on the situation

- Continued improvement on the ability to provide real-time updates to the user either via alerts on the web page or via email updates

3. Organizations

This section is the most basic in content and information. However, it is still in need of additional functionality.

- Provide the user with the ability to search organizations by capability.
- Provide links to the organizations parent site via the registration process (i.e. when an organization is registered, the link is inserted in the database for display on the details page).

4. Displaced Persons

This section is ripe for additional functionality. The basic problem of entering data into the database could be made easier by automating entry of the photo into the database. Additional improvements are:

- Automatic report reconciling missing family members
- Notification reports to camp managers of displaced persons being relocated to their camp
- Additional queries to the database based on demographic information
- Reports generated on displaced persons who are missing family members
- Automated method of integrating photos into the displaced persons database

5. Points of Contact

This module is very similar to the organization module in that the information is basic and easily manipulated. However, the following improvements should be considered.

- Automated method of integrating photos into the point of contact database
- GPS tracking of point of contact location integrated into the database
- Ability to contact POC based on location, including GPS, integrated into a collaborative envelope tool such as Groove

6. Camp Management

This is a very important part of the ROCC in that each campsite, whether it is for an organizations headquarters or a relief area, needs to be registered with information available to those who may need it. The basic information is available in the current version of the ROCC, however other pieces of information may be needed. Further exploration is required in the area.

7. Requirements

If the contact information is the most important aspect of the ROCC, then this section is a close second. This is where there is the most potential for relief operations. This module is ripe for additions in functionality.

- Reports that match providers with requirements
- Automated alerts when capabilities are present to meet specific requirements

- Integrated logistics module that coordinates and monitors delivery of promised goods and services

D. GENERAL DEVELOPMENT

1. Membership Management

Membership management is a very important aspect of any web-enabled environment. In its current version, the ROCC has no membership management capability. It is wide open for any user to join and access the database. This openness was intentional and intended only for the proof-of-concept portion of the project.

Future development in this area must identify business practices for adding organization, points of contact and general users to the ROCC application. There is great potential for further development on the interaction of ROCC and Groove in this area.

2. Access Control

Access control is closely related to membership management, however it is more detailed in its requirements. Presently, any one with access to the ROCC has full privileges within the database. There is no access control presently built into the system. Further development must identify levels of access necessary to ensure adequate information integrity and control, but also information access. Potential levels of access could be:

Administrator	Has full access and privileges associated with maintaining the network and database
---------------	---

Guest	Has viewing access only
Camp Manager	Has ability to view all data and to manipulate data associated with the camp for which they have responsibility
Organization Manager	Has ability to view all data and to manipulate data associated with their particular organization including adding points of contact
General user	Has access to view and manipulate data in certain parts of the database, i.e. requirements, displaced persons, etc.

Table 11. Potential ROCC Access Levels

Other levels of use will have to be explored.

3. Hardware

The current version of the ROCC has been developed over a static network and structured for viewing on a standard desktop. Future versions of the ROCC need to be developed with other computers in mind, i.e. laptops, PDAs and handheld wireless devices.

4. Global Positioning System Integration

An important aspect of contact information is location. The functionality provided in the ROCC should be integrated with the functionality provided with GPS. The software exists to make this happen and the value in this area is immense. Further research needs to be done to correctly integrate these components.

E. MODULARITY

Decision Support Systems (DSS) are interactive, computer-based tools that help decision makers use information and models to solve unstructured problems. Often the term modularity or design by modules is used when describing decision support systems. Modularity during design allows for incremental development and modifications, which can be done on isolated components without affecting the whole system. When a system is built with functional modules or components it is constructed with standardized units based on functional categories providing for flexibility and variety in use depending on the scale and scope of the implementation.

The ROCC application should be built with enough modularity to accommodate the myriad scenarios to which it will be applied during relief operations. A "core" suite of the ROCC should be built to include the basic functionality for any relief operation including a standard database and hardware configuration. This core capability will be rated to accommodate a set number of relief workers and process a set number of individuals receiving aid. As the number of people involved increases, the appropriate number of core component assets will be added.

In addition to the core components, the ROCC should be built with specific functional modules that can be added to the core system based on specific scenarios. The following are some examples of the types of modules that could be added:

- Geographic location - hot weather, cold weather, desert, jungle.

- Size of effort.
- Composition of organizations involved - Military, Civilian, NGO, IO, Independent.
- Modules based on the languages involved.
- Hostile and non-hostile environment.
- Multiple databases.
- Network architecture - mature well-established or expeditionary wireless.
- Application integration - does the scenario provide for the ROCC to tie into a larger system or is it stand-alone.

Modularity allows for the appropriate response to be tailored to the specifics of the requirement. This allows for a level of efficiency and allocation of assets, that directly targets the scale and scope of the operation.

F. CASE-BASED REASONING

Case-based reasoning (CBR) is built upon the premise that humans use an analogical or experiential reasoning approach to learn and to solve complex problems. The idea, much like its human counterpart, is to adapt solutions of similar problems to the problem at hand. The process of case-based reasoning involves two primary steps: (1) find those cases in storage that have solved problems similar to the current problem and (2) adapt the previous solution(s) to fit the current problem context. Figure 24 contains a flow diagram of the solution structure in case-based reasoning.

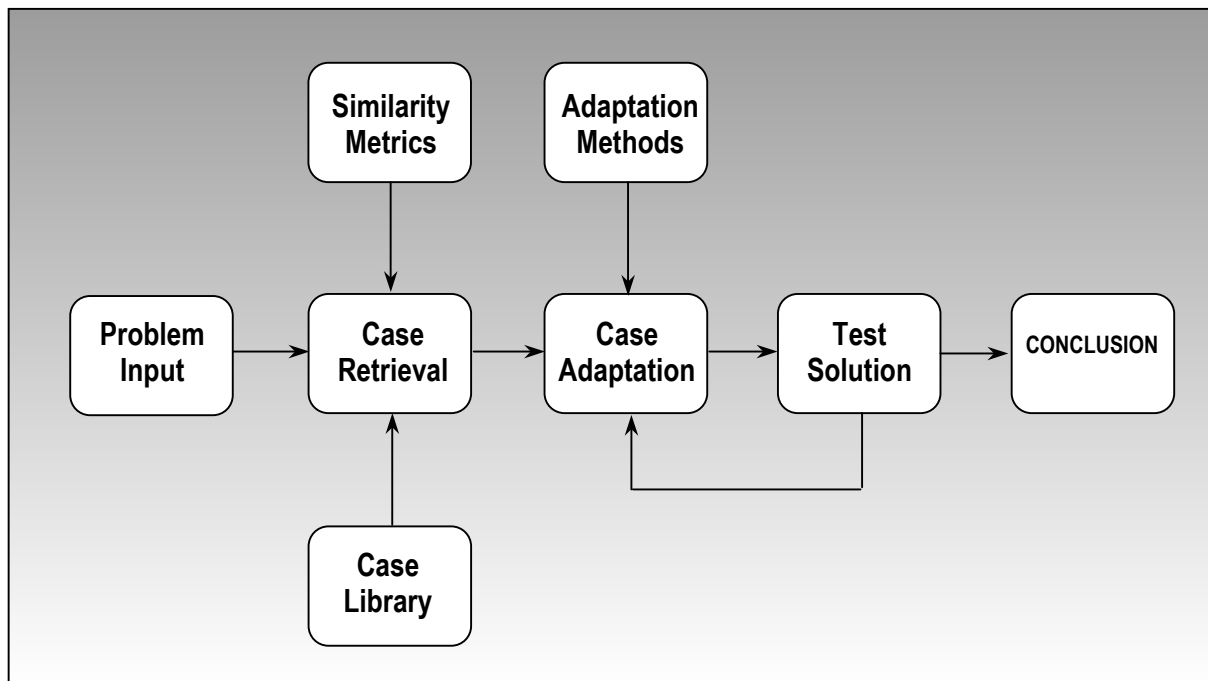


Figure 23. Case Based Reasoning Flow (From: 29)

One of the most critical steps in the process is the location and retrieval of one or more relevant cases from the case library. This is accomplished through a complex set of *case indices* that are used to efficiently search and retrieve cases that are most similar to the current problem. Each potential case is compared to the present problem using a set of *similarity metrics* that measures the degree of similarity between the selected case and the current one. Once this has occurred, the contained solutions are analyzed and adapted to the new situation. This process of adaptation consists of a series of modifications to the parameters of the old solutions to fit the new problem context. Finally, the new solution is tested and, if successful, is added to the case library. If, however, the test fails, then the adaptation process

must be revised or a new set of cases must be retrieved.
(29)

1. Applying Case Based Reasoning to a CHE

As was discussed in the previous section, modularity allows us to tailor our application and hardware assets to the specific scenario at hand. One way of determining which modules will be most appropriate is by using CBR and decision support templates. By comparing the current situation with the historical cases stored in a database we can gain insight into the execution of the current operation. The information can provide us with the assets needed to support the operation as well as providing solutions to complex problems and situations based on successful outcomes to similar situations in the historical database. (Refer to Figure 23) Such a system could be implemented using a knowledge base built on client-server architecture.

Decision support templates are used in combination with CBR in two ways; both as a standardized form or query to input data from the current scenario into the CBR system, and also as an output from the system to guide the user in possible implementation solutions. When a decision support template is used as an input to the CBR, it collects all the necessary information in the format it needs it so the CBR can compare it with the historical database. When used as an output the decision support template provides solution(s) adapted to fit the current problem context. This process of adaptation consists of a

series of modifications to the parameters of the old solutions to fit the new problem context.

As an example the current CHE may involve the following conditions:

- Jungle environment
- Spanish and English speaking participants
- Several factions of guerilla warfare combatants
- An international peacekeeping force
- 50,000 homeless people who need food and shelter
- Poor infrastructure for logistical and communications support.

This set of criteria would be input into the CBR system looking for comparable cases based on set similarity metrics. The output of the CBR system would be similar historical cases adjusted by adaptation methods, which more appropriately fit the current situation. Sample output would include:

- Problems with recommended solutions
- Equipments lists
- Hardware and software configurations
- Appropriate personnel and skill set mixture
- Recommended host nation support entities and points of contact

G. INTELLIGENT AGENTS

Although creativity remains one of the last bastions of human cognitive endeavors, the concept of *intelligent agents* (IAs) is an emerging technology that is rapidly finding its way into all computer-related realms, including that of the DSS, by facilitating users in the delegation of work to a computer. IA technology is truly a glimpse into the future of DSSs and

tomorrow's problem solving because intelligent agents are capable of performing many of the necessary decision support tasks formerly designated as uniquely human activities. They help do things like find and filter information, customize views of information, and automate work. (29)

In our lives, when we find ourselves in a position where time and activities overtake us, we seek help in the form of assistants, people who take care of things we could do ourselves but prefer not to. In the DSS world, intelligent agents play the role of such assistants. IAs function by allowing users to delegate their work to the agent software. IAs are useful in automating repetitive tasks, assisting the user in remembering critical dates or events, or intelligently summarizing complex data. More important, just like their human counterparts, intelligent agents can learn from the user and even make recommendations to you regarding a particular course of action.

An IA can be thought of in two ways: (1) *an agent is one who acts, or who can act* and (2) *an agent is one who acts in place of another person with permission from that person*. Building upon these two common characteristics of intelligent agents, Franklin and Graesser (1996) have offered a formal definition of intelligent software agents that embodies the essence of these two definitions:

An autonomous agent is a system situated within and a part of an environment that senses that environment and acts on it, over time, in pursuit of its own agenda and so as to effect what it senses in the future. (47)

Intelligent Agents possess certain characteristics, which differentiate them from other software and computer-based programs.

1. Autonomy

An agent must display a measure of autonomy from its user. In other words, once initiated it has control over its own actions. This is good because when you delegate something to your agent, you expect it to have the independence to work on your request no matter what happens around it. To this end, a software agent must be able to display a certain level of spontaneous execution and preemptive or independent action with the intent of benefiting its user. In this respect, IAs differ from other computer programs, which tend to respond only to direct manipulation and otherwise function without any awareness of the conditions in which they are operating.

2. Reactive

An agent must be relatively reactive. That is, an IA must sense changes in its environment and respond in a timely fashion. This characteristic of agents is also at the core of delegation and automation. Just as you tell your assistant, "When x happens, do y," an agent is always waiting *for* x to happen! Finally, in order to carry out the wishes of the user, all agents must be continuously operational, even when the user is gone.

3. Personalizability

The whole point of an IA is to enable a user to perform a task, such as information gathering or data analysis, better than he or she could do alone. Because each decision maker is unique and each problem context is different from the last, an IA must be educable in the task at hand and how to perform it. A learning agent that can acquire the necessary information it needs to function, in part, by initially monitoring the actions of its user displays the characteristic of personalizability.

4. Discourse and Cooperation

To ensure that an IA shares the agenda of its user and can carry out the task in the manner desired; some form of discourse or two-way feedback is required. This discourse allows both entities to make their intentions and abilities known to the other and, through this feedback, agree on something resembling a contract about what is to be done, by whom, and when.

In addition to feedback or discourse with the user, IAs may need to invoke one or more additional IAs to help them accomplish a task. In this sense, an IA must possess the ability, when necessary, to interact and communicate with other related IAs. To this end, some IAs are considered "social." That is, they interact, or communicate with other agents.

5. Risk, Trust, and Domain

Implicit in the concept of an intelligent agent is the notion of delegation. If we do not trust the entity to

carry out the task that we have delegated to it, then we are faced with performing the task ourselves. Even if we have the required level of trust in the agent, by delegating responsibility for a task to an external agent we expose ourselves to the risk that the agent will do something wrong. The use of intelligent software agents requires a balance between the risks associated with relinquishing control of an operation and our level of trust in the technology. This decision requires the user to possess a reasonably accurate mental model of not only what the agent will do (hence, the level of trust we ascribe to it) but also the problem context and domain of interest.

6. Types and Classification of Agents

- Organizational Agent - performs tasks on behalf of the organization. Has an enterprise perspective.
- Personal Agent - acts on behalf of the individual. May have an enterprise perspective but only takes actions for a individual user.
- Regulation Agent - Reacts to each sensory input as it comes in and always knows what to do. This agent neither plans nor learns.
- Planning agent - Performs planning functions using case-based reasoning or randomizing algorithms, this agent can not learn.
- Adaptive agent - These agents can learn while simultaneously performing planning.

7. Intelligent Agents for the ROCC

- Membership Management
- Access Control
- Change notification
- Alert Notification
- Automated email notification and delivery

- Broker agent that matches requirements with providers
- Resource monitor that notifies and places orders for inventory.
- Food distribution monitor
- Displaced persons match for family members

H. SUMMARY

The biggest challenge for this project will not be technological; it will be breaking down the communication barriers and building trust among these organizations. The following table outlines risk areas that must be addressed as the implementation phases of this project continue.

Risk Rating	Risk Item
Low	<p>Technological limits of a wireless network. Current technologies will support all functionality of the proposed application, however as requirements for more graphics-intensive components of future versions are incorporated there may be problems with available bandwidth.</p> <p>Ensure a balance is achieved between the capabilities of the available networks and the need for information. A trade off may need to be established between the limitations of a wireless network and functionality of the application.</p>
High	<p>Cultural Barriers and Organization mindsets. There is a high risk in the willingness of organizations to undergo a cultural change in the way they do business and use technology.</p> <p>A major part of overcoming this change will be brokering an agreement among stakeholders that there currently is a problem and that this application can solve or facilitate the problem.</p>

Medium	<p>Military/NGO communication barriers. There will also be a challenge to get Military/NGO organizations to be more willing to share information for the project to be a success.</p> <p>This risk can be mitigated through an aggressive education and training program.</p>
High	<p>Information Management. As with any information system its effectiveness depends on having the right information at the right time and place.</p> <p>The identification of an entity that can credibly and accurately manage the information requirements necessary for successful peacekeeping operations. It is imperative that each organization understands the business processes involved and the information required to support them.</p>
Medium	<p>Technological learning curve. In addition to overcoming traditional ways of doing business, there will also be a learning curve for users of the system to become familiar with the use of wireless devices and hand held computers. Users who are comfortable with standard Internet browsing will have no problem learning the application itself.</p> <p>This risk can be mitigated through an aggressive education and training program.</p>
High	<p>Difficult Operating environment. The application will be used, in most cases, in a very harsh environment ranging from flooded plains, snow covered mountains to parched wind blown deserts.</p> <p>The hardware used will have to be hardened and reliable in operating under such conditions.</p>
Medium	<p>Security of information. As with all networked computer systems safeguards for security and integrity concerns must be put in place including virus and malicious attack protection.</p> <p>We will ensure that all pertinent security</p>

	measures are put in place and that all users are aware of any security concerns. Remember, there is no totally secure network.
Medium	<p>Commitment of stakeholders. For this project to be successful we will need buy-in and commitment from those organizations that will benefit from this application. It is critical that the application addresses their needs and requirements and that the organizations are willing to put forth the effort to successfully implement the application.</p> <p>This risk can be mitigated through an aggressive education and training program.</p>

Table 12. Risk Items

This completes the first phase of the project as described in Chapter 1. Phase 2 is already underway with another group of thesis students. They will use existing Commercial off the Shelf (COTS) technology to establish Internet connectivity and to setup an ad hoc wireless network in the field/tactical environment that will enable the completion of phase 2. Software agents will be incorporated into the prototype to facilitate situational awareness and provide decision support functionality.

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APPENDIX A

From: Major Todd Ford
To: Dr. Alex Bordetsky
Dr. Nancy Roberts
Major Jim Hogan
Major Mike Perry

**Subj: TRIP REPORT, THESIS RESEARCH TO SARAJEVO, BOSNIA AND
HERZEGOVINA, 22 - 28 JULY 2001**

Encl: (1) Proposed itinerary

1. The purpose of this trip was to conduct interviews with designated representatives from organization that may have input to the content of our thesis. The contacts were as follows:

- a. Office for the Security and Cooperation in Europe (OSCE), LtCol Shae Duffy
- b. UN International Police Task Force (IPTF), Mr. Dennis LaDucer
- c. UN Office of the High Representative, Wing Commander Ian Todd and Major Allan Poston
- d. World Bank, Mr. Goran Tinjic
- e. United States Agency for International Development (USAID), Mr. Robert (Pat) Jacobs and Mr. Jonathan Sperling
- f. International Federation of the Red Cross and Red Crescent Societies, Mr. Ashot Sargsyan
- g. Headquarters, Stabilization Force (SFOR), Dr. James Orzeck (Historian)

2. The following are the summaries of the discussion with each organization and its representative(s). For brevity, the discussions are mostly "bulletized".

3. Office for Security and Cooperation in Europe (OSCE)

- a. Point of Contact Information

LtCol Shae Duffy (Irish Army)
Chief of Plans and Policy Regional Stabilization
Office for Security and Cooperation in Europe (OSCE)

Obala Kulina Bana 11
7100 Sarajevo
Boasia and Herzegovina

Phone: 033/292-344
Fax: 033/292-354
Email: shayd@oscebih.org

b. Interview Discussion

Organizational Mission: to support elections and provide for regional stabilization (both a civilian and military mandate)

- Began with arms control and election stability
- Essentially focused on democratization
- Political mandate

He had served a year in Bosnia during 96-97 but has been in his current job for four months.

Did not stick with research questions because of the organization's mission and his background. He was supportive of the project, however he was primarily focused on the mandates of the organizations and the distrust among the different groups. The difficulty of communication between organizations was discussed, but only at the policy level. He does not have a technological background and didn't address any specific content issues.

His office does use computers with Windows Operating Systems and Microsoft Office. They do have Internet and email access at a maximum of about 20 Kbps (on a good day). They also have a dial-in server.

Not much interaction with NGO during relief efforts other than to assist in organizing elections (applicability?).

We did discuss the merits of our study:

Information from NGO's could be invaluable if on people, infrastructure, and political climate. Would help him with his job.

KEY POINT: Be mission focused, not worried about a distorted architecture. Design the tool with flexibility in mind. Don't focus on just the NGO requirements; take a hard look at the needs of the IO's as well.

"An NGO fits in the cracks of any operation"
Their biggest contribution is their enthusiasm.

Advised that we contact UNDPKO (United Nations
Department of Peace Keeping Operations). I agree.

KEY POINT: NGO's range from large organizations to
individuals.

What size does the UN recognize? Does an
organization have to be over a certain size? How
do we account for the individual who is working
alone? (i.e. Irishman who was working to rebuild
some schools outside of town. He was not
affiliated with any particular organization and
used whatever material he could get.)

I asked him who should be responsible for this system.
He stated that the UN naturally fit into that role.
However, he also stated that a foundation (maybe
initiated by the UN but eventually external to the UN)
could be started to specifically focus on this issue,
similar to the HCIC in the Virtual Diplomacy article.

He is going to be in Monterey in October for the
conference being set up by Col Tomasovic.

c. Overall Assessment

Overall, he was supportive of the project, but he is a
poor source of information for the content of this
project. He would be an excellent source for follow-
up information on implementation and difficulties
associated with organizational relations. Maybe he
could help Marlyn on her thesis.

4. UN International Police Task Force (UN IPTF)

a. Point of Contact Information

Dennis LaDucer (retired Orange County Sheriff)
Deputy Police Commissioner
International Police Task Force (IPTF)
UN House Phone: 033/292-344
UNMIBH, Headquarters Fax: 033/292-354
Aleja Bosne Srebrenice bb Email: shayd@oscebih.org

Nedjarici, 71000 Sarajevo

b. Interview Discussion:

Organizational Mission: to provide a safe and secure environment

- Teach the principles of democratic policing

He has been in his current job for 16 months.

Did not stick with research questions because of the organization's mission and his background.

Again, there was discussion of the problem with conflicting or limited mandates.

- "Mandates bump into each other"
- "People want to get information, but they don't want to give it"

His office does use computers with Windows Operating Systems and Microsoft Office. They do have Internet and email access at a maximum of about 20 Kbps (on a good day). They also have a dial-in server.

He does work with NGOs when working housing issues for some of the retrained officers. These officers were displaced from their homes and the IPTF tries to get them back in their neighborhoods to work.

He was very supportive of the project. His content interest was as follows:

- NGO information (what they do, where they are, who is the main POC)
- Displace persons and other migrants
- Would like to be able to post his mandate
- Provide information on needs that his people come across in their dealings with the population (i.e. medical treatment required, etc)

He will be in Monterey in October for the conference set up by Col Tomasovic.

c. Overall Assessment

He was very supportive of the content of the project. He did address the trust issues and differences in cultures among different organizations. Would be a good source for future input.

5. UN Office of the High Representative (UN OHR)

a. Point of Contact Information

Wing Commander Ian Todd (United Kingdom)
Emerika Bluma 1 Phone: 387-33-283-961
7100 Sarjevo Fax: 387-330283-501
Bosnia and Herzegovina Email: ian.todd@ohr.int

Major Allan Poston
Emerika Bluma 1 Phone: 387-33-283-719
7100 Sarjevo Fax: 387-330283-501
Bosnia and Herzegovina Email: allan.poston@ohr.int

b. Interview Discussion

Multiple agencies may respond to a specific need

- Need a coordinating agency
- Massive overlap occurs at all levels

Need the following information:

- Resource based information
- Lack of resources
- Information on those who need help
- Who needs what (individuals, communities, etc)
- Communal work needed (infrastructure)
- Dangers (Hot spots)
- Weather
- Communication means available (radio frequencies, phone lines, etc)
- Logistical support coordination (most emphasized area of discussion)

Recommended organization to run system:

- IFRC
- UN

c. Overall Assessment

The OHR has a lot to worry about in theater. They cover a lot of ground. They were very receptive to the idea and definitely support the development. They volunteered to continue to provide information and to provide additional points of contact as required.

6. World Bank

a. Point of Contact Information

Goran Tinjic
Operations Analyst
H. Kresevljakovica 19 Phone: (387 33) 440-293
7100 Sarajevo Fax: (387 33) 440-293
Bosnia and Herzegovina Email:
gtinjic@worldbank.org

b. Interview Discussion

"Lack of coordination led to an uncoordinated, messy effort"

- quote related to his experience in monitoring activities in Kosovo
- donor aid was moving in at the same time as military aid
- there was total chaos in the relief efforts

The World Bank's mission is generally to introduce sustainable economic activity both with micro- and macro-finance efforts

The size of the market (need) should determine the size of the response. Again referring to Kosovo.

Important thing is timely, accurate information and ensuring updates are quickly provided

Would like to have a donor database with a basic profile

- source of conflict among NGOs

Would like a DB with:

- Human resources, who is available, what is their experience, where is their experience,
- what are the demographics of the affected area and the people providing the help

Important info:

- background information on community
- cultural issues (appropriate/inappropriate behavior)

Military needs to understand the different development efforts and objectives

World Bank does communicate with the military on a case-by-case basis

- rebuilding efforts to World Bank (i.e. military identifies area of need, usually infrastructure)
- employment intervention for ex-soldiers
- sometimes difficult (interests vary)

Troop deployments/placement may be affected by cultural issues (certain militaries may function better in certain places than others)

Check the International Crisis Group (ICG) website

World Bank has a project "Global Development Gateway" that is a web-based tool to track activities. Being developed in D.C.

Indicated that the UN would be an appropriate agency to manage our tool if implemented.

c. Overall Assessment

Mr. Tinjic was supportive of our efforts and wished us the best of luck. He also agreed to provide additional information if it is required.

7. United States Agency for International Development (USAID)

a. Point of Contact Information

Robert (Pat) Jacobs
USAID
Obala Kulina Bana 1
Sarajevo

Phone: 033/667-900
Fax: 033/667-892
Email: Robert@usaid.gov

Jonathan L. Sperling

7010 Duncraig Court
McLean, VA 22101

Phone: 703-734-9072
Fax: 703-734-0688
Email: khyber95@aol.com

b. Interview Discussion

Mr. Jacobs was the original target for the interview, however he had been in country for only a short while. He referred me to Mr. Sperling, who was occupying the office next door. Mr. Sperling had participated in the conference that CCMR had run in Monterey the year before. He will be in Monterey again this October.

Mr. Sperling is currently an advisor to USAID after serving a long career with them. He has been in Africa (4 years), Jamaica (1 yr), Yemen (1 yr) and Bosnia (1 yr). His focus is on the rebuilding of the physical infrastructures of the target countries.

He was very supportive of our project and has offered his time if we need to contact him in the future. Maybe we could arrange a short meeting with him in October.

USAID has funding to spend on relief efforts, primarily infrastructure and community re-establishment.

- are creating a Bureau for Conflict Resolution

Other topics of discussion were:

- Community re-integration
- micro-credit and the organizations involved
- USAID is interested in tracking funds provided to small businesses and individuals (several organizations provide this service)
- USAID assists the small business and individual in obtaining and submitting the application package

Information topics for the tool:

- Crop information
- Health information
- NGO Activities
 - o Who are they
 - o What do they plan to do

- o What is their mandate
 - o What skill sets do they have
 - o How long will they be there
 - o What is the background, experience in certain location of their workers
 - o What support equipment is available
- What is the cultural information for the area
- What is the communications infrastructure available
- How are the roads, airports, ports and the capacities
- What are the social, economic conditions
- What are the priorities as seen by the people needing assistance

Check the IOM (International Organization for Migration) website.

- website for displaced persons

Need to arrange the interface between the military and the civilian organizations

- right now it's a "sales job" on cultural issues
- need to outline Tasks and Goals

Recommends developing a scenario for our project

- either made up or based on historical situation

Thinks the military is best suited to manage the tool, however also thinks the UN has a natural fit. But would need to find the right fit within the UN. He advised that we contact Mr Don Hayes (currently an assistant the Ambassador Hollbrook.

Also thinks a contractor or a specific NGO (IFRC, Care, Catholic Relief) could run the system if implemented.

Recommended that I meet with Mr Ashat Sargsyan of the IFRC. (I did meet with him on Friday before going to the airport).

Also recommended contacting Jeff Malick, a retired USAID worker. No contact information.

USAID has a Information Management Research program (Nat Coletta). They may be able to give us some information on related issues.

c. Overall Assessment

Mr. Sperling was very excited about the project. "It will get rid of the chaff" was his comment. He would be a good source for future input.

8. International Federation of the Red Cross and Red Crescent Societies

a. Point of Contact Information

Mr. Ashot Sargsyan

Senior Programme Coordinator Phone: 387-33-666-009

Marsala Tina 7

Fax: 387-33-666-010

7100 Sarajevo

Email:

ifrcbih06@ifrc.org

Has worked 12 years with IFRC (Bosnia, USSR, Armenia)

- Everything from war to natural disasters

b. Interview Discussion:

Coordination is a sensitive term

- Need an information sharing process
- Different organizations have different tasks
- Efforts conflict with each other

There is a feeling of a lack of information between organizations themselves and between organizations and the military

- There has been little follow-up after meetings

Need to be clear as to what type of information needs to be shared

"How do you evaluate the affects of coordination?"

The IFRC would support providing and receiving information:

- Mission, budget, stores
- Mandates

- Intentions, expectations
- What kind of work to be done
- Who will receive the support
- Why are you doing it
- How long are you going to do it
- Which organizations will take what responsibilities according to their mandates
- Donor influence over organizational activities

The IFRC is heavily involved in repatriation

- Advocacy
- Community Development
- Relocation

The IFRC has started Field Assessment Teams (FACT)

- 2-4 people
- Different backgrounds
- Deployed to evaluate situation
- Possible has FACT teams made up of different organizations?

IFRC website has good information. Recommends that we read:

- Civil Agreement (1997)
- Agreement on the Organization of the International Activities of the Components of the International Red Cross and Red Crescent Movement
- Current guidelines from the SPHERE project
- IFRC Strategy 2010
- Plan of Action Agreed upon at the 27th IRC Conference

His recommendations for running the system:

- IFRC
- UN

c. Overall Assessment

Mr. Sargsyan saw me after a last minute phone call and was very gracious. He spent a lot of time with me. He is very supportive of the project and recommended that we monitor the IFRC web site. They are working on a tool to share information but not in the same way

that we are. He is willing to continue providing information.

9. Headquarters, Stabilization Force (SFOR)

a. Point of Contact Information

Mr. James Orzech (Historian)

Historical Office Phone: 387-33-495-327

HQ SFOR (Butmir) Fax: 387-33-495-327

APO AE 09780 Email:

James.Orzech@sfor.nato.int

b. Interview Discussion:

Mr. Orzech was not able to spend much time with me. We had lunch and briefly discussed the project. His response was tame but enthusiastic, and he offered to continue corresponding with us if we needed him. He will be here in October for the Center for Civilian and Military Relations (CCMR) conference.

10. The interviews were very successful in their response and support for this project. There were several themes that were pervasively present in each. Primarily revolving around the need for communication and the current lack of it. It seems as if a good summary is "anything is better than nothing"

APPENDIX B

Entity	Definition
tblOrganization	This table will contain information related to the organizations involved in the operation. This data will be closely linked to the information for contacts.
tblContact	This table will contain information related to individuals involved in the operation. This data will be closely linked to the information for organizations, sites and meetings.
tblContact2Site	This is an intersection table that will link contacts to individual sites throughout the area of operation.
tblMeeting2Contact	This is an intersection table that will link meetings to contacts.
tblMeeting	This table will contain information related to the meetings established by individuals involved in the operations. This data will be closely linked to the information on contacts via the Meeting2Contact table.
tblSite	This table will contain information related to each location established within the area of operations. This data will be closely linked to the information on contacts via the Contact2Site table.
tblRefugee	This table will contain information related to the displaced persons within the area of operations. This data will be closely linked to the information on sites.
tblRequirement	This table will contain information related to requirements at each site. The data will be closely related to the information on sites.

tblOrganization

This entity contains:

Property	Description	Type	Field Size	Constraints
OrgID	Primary key	Auto number	Long integer	No duplicates
Name	Organization's name	Text	Char (20)	None
TypeOrg	Type of organization	Text	Char (20)	None
Mandate	File name of organization's mandate	Text	Char (20)	None
AddressLine1	Line 1 of organization's address	Text	Char (50)	None
AddressLine2	Line 2 or organization's address	Text	Char (50)	None
City	City	Text	Char (50)	None
State_Province	State or Province	Text	Char (4)	None
ZIP	Postal code	Text	Char (10)	None
Country	Country	Text	Char (4)	None
OrgStatus	Status of organization in operation (active/inactive)	True/False	N/A	None
OrgDate	Date of entry into the database	Date	Date/Time	Format: DD/MM/YYYY
OrgTime	Time of entry into the database	Time	Date/Time	Format: MM:HH

tblContact:

This entity contains:

Property	Description	Type	Field Size	Constraints
ContactID	Primary key	Auto number	Long integer	No duplicates
OrgID	Foreign key	Number	Long integer	From tblOrganization
FirstName	First name of contact	Text	Char (30)	None
LastName	Last name of contact	Text	Char (30)	None
UserName	User name for account access	Text	Char (10)	None
Password	Password for account access	Text	Char (10)	None
Access	Level of access	Text	Char (10)	None
TypeContact	Type of contact (military, IO, etc)	Text	Char (10)	None
Phone	Phone number	Text	Char(20)	Format: (000)000-0000
Email	Email address	Text	Char (50)	None
Pager	Pager number	Text	Char (20)	None
Rank_Position	Rank or position of contact	Text	Char (20)	None
Description	Description of job or skills	Text	Char (250)	None
Picture	File name of picture	Text	Char (30)	None
Status	Contact status (active/inactive)	True/False	N/A	None
POCDate	Date of entry into the database	Date	Date/Time	None
POCTime	Time of entry into the database	Time	Date/Time	None

tblContact2Site:

This entity contains:

Property	Description	Type	Field Size	Constraints
ContactID	Foreign key	Number	Long integer	From tblContact
SiteID	Foreign key	Number	Long integer	From tblSite

tblMeeting2Contact:

This entity contains:

Property	Description	Type	Field Size	Constraints
MtgComboKeyID	Primary key	Auto number	Long integer	No duplicates
MeetingID	Foreign key	Number	Long integer	None
ContactID	Foreign key	Number	Long integer	None
mtgChangedOK	Records user acknowledgement of change	Number	Long integer	None
mtgCanceledOK	Records user acknowledgement of cancellation	Number	Long integer	None

tblMeeting:

This entity contains:

Property	Description	Type	Field Size	Constraints
MeetingID	Primary key	Auto number	Long integer	No duplicates
mtgName	Subject of meeting	Text	Char (20)	None
mtgLocation	Location of meeting	Text	Char (20)	None
mtgDate	Date of meeting	Date	Date/Time	Format: (DD/MM/YYYY)
mtgTime	Time of meeting	Time	Date/Time	Format: (MM:HH)
mtgDescription	Meeting Description	Memo	Char (250)	None
mtgCreator	ContactID of person creating the meeting	Number	Integer	From tblContact
mtgChanged	Has the meeting been changed	Number	Integer	None
mtgCanceled	Has the meeting been canceled	Number	Integer	None

tblSite:

This entity contains:

Property	Description	Type	Field Size	Constraints
SiteID	Primary key	Auto number	Long integer	No duplicates
SiteName	Name of site	Text	Char (20)	None
SiteContact	Name of Primary Contact	Text	Char (30)	None
Phone	Phone number	Text	Char (15)	None
Frequency	Radio frequency	Text	Char (10)	None
AddressLine1	Line 1 of organization's address	Text	Char (30)	None
AddressLine2	Line 2 or organization's address	Text	Char (30)	None
City	City	Text	Char (20)	None
State_Province	State or Province	Text	Char (5)	None
ZIP	Postal code	Text	Char (10)	None
Grid	Grid coordinate for site location	Text	Char (10)	None
LatLong	Latitude and Longitude location for site	Text	Char (20)	None

tblRequirement:

This entity contains:

Property	Description	Type	Field Size	Constraints
RequirementID	Primary key	Auto number	Long integer	No duplicates
SiteID	Foreign key	Number	Long integer	None
Type	Type of requirement	Text	Char (20)	None
DateRequested	Date of request	Date/Time	Date/Time	Format: (DD/MM/YYYY)
TimeRequested	Time of request	Date/Time	Date/Time	Format: (MM:HH)
Description	Requirement description	Memo	Char (250)	None

tblRefugee:

This entity contains:

Property	Description	Type	Field Size	Constraints
RefugeeID	Primary key	Auto number	Long integer	No duplicates
SiteID	Foreign key	Number	Long integer	None
FirstName	First name of displaced person	Text	Char (20)	None
LastName	Last name of displaced person	Text	Char (20)	None
Age	Age of displaced person	Number	Integer	None
Sex	Sex of displaced person	Text	Char (1)	None
MaritalStatus	Marital status of displaced person	Yes/No	Yes/No	None
SpouseName	Spouse's name of displaced person	Text	Char (30)	None
MissingChild	Is the displaced person missing a child?	Yes/No	Yes/No	None
MissingAdult	Is the displaced person missing an adult?	Yes/No	Yes/No	None
NeedClothing	Does the displaced person need clothing?	Yes/No	Yes/No	None
NeedMedical	Does the displaced person need medical?	Yes/No	Yes/No	None
Picture	File name of picture of displaced persons	Text	Char (20)	None
HomeOrigin	Home of origin for the displaced person	Text	Char (25)	None
DateEntered	Date the record was entered into the database	Date/Time	Date/Time	Format: (DD/MM/YYYY)
Comments	Text field to hold any additional information	Text	Char (250)	None

APPENDIX C

Information concerning each entity, its attributes, relationships, normal forms and constraints are summarized in the tables below.

Entity Name:	tblOrganization
Attributes:	<u>OrgID</u> , Name, TypeOrg, Mandate, AddressLine1, AddressLine2, City, State_Province, ZIP, Country, OrgStatus, OrgDate, OrgTime
Attribute Specifications:	OrgDate is automatically populated when the record is entered into the database OrgTime is automatically populated when the record is entered into the database
Relationships:	1:N (tblContact)
Normal Form:	Third
Business Rules/ Constraints:	None

Entity Name:	tblContact
Attributes:	<u>ContactID</u> , OrgID ^{FK} , FirstName, LastName, UserName, Password, Access, TypeContact, Phone, Email, Pager, Rank_Pos, Description, Picture, Status, POCDate, POCTime
Attribute Specifications:	<p>OrgID will come from the tblOrganization</p> <p>Status is a true/false record to indicate whether the contact is active/inactive</p> <p>POCDate is automatically populated when the record is entered into the database</p> <p>POCTime is automatically populated when the record is entered into the database</p>
Relationships:	<p>1:N (tblContact2Site)</p> <p>1:N (tblMetting2Contact)</p> <p>N:1 (tblOrganization)</p>
Normal Form:	Fourth
Business Rules/Constraints:	A contact for an organization will not be able to be entered until an organization is present in the database.

Entity Name:	tblContact2Site
Attributes:	ContactID ^{FK} , SiteID ^{FK}
Attribute Specifications:	<p>ContactID will come from tblContact</p> <p>SiteID will come from tblSite</p>
Relationships:	<p>N:1 (tblContact)</p> <p>N:1 (tblSite)</p>
Normal Form:	
Business Rules/Constraints:	This table is populated when an contact is associated with a site

Entity Name:	tblMeeting2Contact
Attributes:	<u>MtgComboKeyID</u> , MeetingID ^{FK} , ContactID ^{FK} , mtgChangedOK, mtgCanceledOK
Attribute Specifications:	MeetingID comes from tblMeeting ContactID comes from tblContact
Relationships:	N:1 (tblContact) N:1 (tblMeeting)
Normal Form:	
Business Rules/ Constraints:	None

Entity Name:	tblMeeting
Attributes:	<u>MeetingID</u> , mtgName, mtgLocation, mtgDate, mtgTime, mtgDescription, mtgCreator, mtgChanged, mtgCancelled
Attribute Specifications:	mtgCreator is the ContactID from tblContact
Relationships:	1:N (tblMeeting2Contact)
Normal Form:	
Business Rules/ Constraints:	

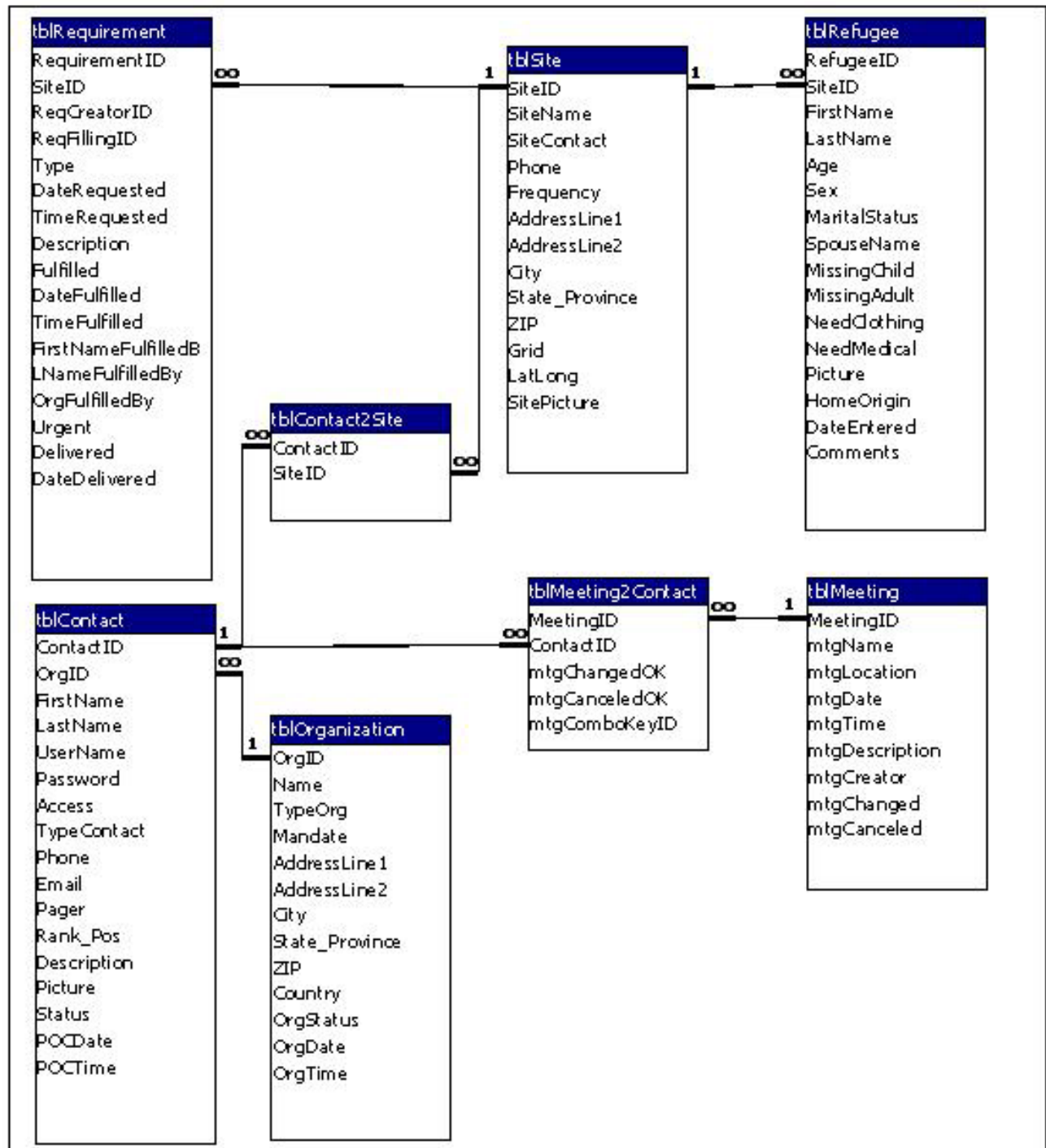
Entity Name:	tblRefugee
Attributes:	<u>RefugeeID</u> , SiteID ^{FK} , FirstName, LastName, Age, Sex, MaritalStatus, SpouseName, MissingChild, MissingAdult, NeedClothing, NeedMedical, Picture, HomeOrigin, DateEntered, Comments
Attribute Specifications:	<p>SiteID comes from tblSite</p> <p>Sex is a checkbox field (male or female)</p> <p>MissingChild is a yes/no box</p> <p>MissingAdult is a yes/no box</p> <p>NeedClothing is a yes/no box</p> <p>NeedMedical is a yes/no box</p> <p>DateEntered is automatically populated when the instance is created</p>
Relationships:	N:1 (tblSite)
Normal Form:	Third
Business Rules/Constraints:	A displaced person cannot be associated with a site until the site is created in the database.

Entity Name:	tblRequirement
Attributes:	<u>RequirementID</u> , SiteID ^{FK} , Type, DateRequested, TimeRequested, Description
Attribute Specifications:	SiteID comes from tblSite
Relationships:	N:1 (tblSite)
Normal Form:	Third
Business Rules/Constraints:	

Entity Name:	tblSite
Attributes:	<u>SiteID</u> , SiteName, SiteContact, Phone, Frequency, AddressLine1, AddressLine2, City, State_Province, ZIP, Grid, LatLong
Attribute Specifications:	
Relationships:	1:N (tblRequirement) 1:N (tblRefugee)
Normal Form:	Third
Business Rules/ Constraints:	

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APPENDIX D



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